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COPRA AND COCONUT PRODUCTS.

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IN view of the interest which is being taken in the local manufacture of coconut oil by those connected with the local coconut industry and the importance of this product in the Federated Malay States, the following resumé of recent scientific investigations on copra, coconut oil and other coconut products, together with observations by the writer have been prepared for general information.

The most promising feature in connection with the industry in this country is the realization of the importance of the local manufacture of the final product—coconut oil—from copra or the fresh meat of the coconut, a project which is based on sound economic principles.

In support of this, some remarks made recently by Mr. J. C. Umney—a well-known manufacturer of essential oils in Great Britain, may be quoted. They are as follows:

"It is a sound doctrine of political economy that the ideal condition of a given industry is that the country where the raw materials are provided should in the main and in the absence of antagonistic influences, be also the country in which the finished article is manufactured from the locally produced raw material. From an imperialistic point of view, if this prejudices English oil mills, we have the comfort of knowing that it enlarges imperial interests."

Competition with Palm Oil and Palm Kernel Oil.

These remarks apply particularly to the coconut industry and the local manufacture of coconut oil, not only at the present time on account of the high rates of freight, but even in normal times, in view of the comparatively long distance of this country from Europe and America, compared with other countries, *e.g.*, West Africa, Nigeria, etc., where the production of palm oil and palm kernel oil or the export of palm kernels from both the palms indigenous in the forests of the country and those being grown on plantations, is likely to compete to a large extent with coconut oil for many purposes.

It is not proposed in this article to deal with palm oil or palm kernel oil, but it may be remarked, *en passant*, for the benefit of those who have no information on the subject, that large concessions have been granted since 1913 in British, French and Belgian West

African possessions for the purpose of exploiting the African oil palm. Soap manufacturers and others interested in the oil industry have been granted concessions with the object of developing the industry on a scientific basis, by the introduction of special machinery for the extraction of palm oil and palm kernel oil, to replace the somewhat crude and certainly wasteful native methods.

This development has been necessitated particularly to safeguard the industry for imperial purposes, on account of the scientific development and exploitation of the oil palm in other foreign West African possessions, especially those of Germany. As is well known, large exports of palm oil and palm kernels, the latter particularly, have been made to Germany.

Objections to the Export of Copra.

Two important disadvantages may be mentioned in connection with the export of copra (1) the bulky nature of the product, (2) the fact that a large quantity of valuable fertilizing or feeding material is being sent out of the country in the export of copra.

The former disadvantage is especially acute at the present moment and will probably be for several years after the war, and the export is in any case wasteful from the point of view of freight.

The latter disadvantage is not of immediate importance, owing to the fact that coconuts are being grown on virgin soil, the fertility of which will last probably for a number of years. It is a point, however, of considerable future importance and one to which serious attention is now being paid in India in connection with the export of many other oil seeds. Several projects are on foot in the latter country for the erection of local oil mills, for the manufacture of coconut oil and oils from various seeds, *e.g.*, castor oil, ground-nut oil, rape oil and gingelly oil.

Similar attention is being paid to the problem in Ceylon and more particularly in the Philippine Islands, where at the present time many oil mills are being erected and are said to be making large profits by the manufacture of coconut oil. It is stated that in two or three years little or no copra will be exported from the Philippines.

In regard to the bye-product from the manufacture of the oil—*viz.*, coconut cake or poonac, it may be stated that this cake, like all oil cakes which can be fed to cattle, is of more value for cattle feeding purposes, and consequently fetches a higher price for this purpose than for fertilizing purposes. In the event of cattle breeding proving a successful proposition in this country, this product would have a local value as a subsidiary cattle food. Australia also provides a ready market for the oil cake.

Transport of Oil.

The principal drawback to the export of the oil is the difficulty in connection with transport. If exported in barrels, it is probable that the staves, etc., for such barrels would have to be imported, although it may be found possible to manufacture these locally from local timber and thus start a new subsidiary industry. The export in drums or tins would be costly. The real solution of this problem would appear to be by export in tank steamers using large drums for

local transport only. The only objection to this is the fact that while coconut oil is liquid at the normal shade temperature in this country (85° Fah. approx.) it would solidify before reaching Europe, especially during the winter. The objection, however, is not a serious one and can be overcome by having the tanks connected to steam-heated coils, or other arrangements for heating such as steam jacketing the tanks, etc., and utilizing exhaust or waste steam from the ship's boilers. It will probably be advantageous to allow the oil to solidify and to re-melt before unloading. Pumps could be used to remove the oil from the tanks in a cold climate. It may be stated here that both in the Philippines and in connection with a big scheme for the manufacture of coconut oil in Southern India and Ceylon the idea of employing tank steamers is under consideration.

Manufacture of Coconut Oil from Fresh Coconut Meat.

The most important development of the industry, however, especially in connection with the local manufacture of the oil, is the suggestion, which has been made by the writer and others independently in this country, to express the oil from the fresh coconut meat, either before or after partial drying, instead of manufacturing copra.

Although this idea is particularly applicable and suitable for the local production of oil and is supported by the writer and others from this point of view entirely, it does not follow that the preparation and export of the dried grated fresh meat, after pressing into suitable cakes, is not also a feasible proposition, since sun-dried or artificially dried copra and therefore artificially dried grated fresh coconut meat could be exported, with little liability to attack by mildews or moulds, provided the moisture-content is not above a certain limit. The deterioration of copra, both in oil-content and in loss of weight due to destruction of other constituents of the copra or meat, on account of the development of fungus or bacterial growth is entirely a question of moisture-content.

It is hoped, however, that suitable methods will be devised, and the writer has reason to believe that such are being devised, for the preparation on an economic commercial basis of the dried or partially dried fresh grated meat.

One important point, to which attention is directed in this connection, is the most economical and satisfactory moisture-content of such material for the expression of the maximum amount of oil. It may not be essential or economical to dry the material to as low a moisture-content, for example, as say 5 per cent.

It need scarcely be added that the manufacture of oil from coconut meat prepared in this manner would yield a pure white oil of excellent quality for edible purposes and that the residual meal might also probably find a market to a large extent for human consumption.

Recent Scientific Investigations.

Comparatively little investigation of coconuts and coconut products has been carried out hitherto in tropical countries in connection with this problem and it may be stated generally that the manufacture of copra, in most tropical countries in which the coconut palm is cultivated, is a somewhat crude and unscientific process.

The literature on the coconut palm also is conspicuous for the absence of really scientific information, both from a chemical and an agricultural point of view.

The most important investigations, which have been carried out recently and with which this article is principally concerned, are those made by various members of the Philippine Bureau of Science and Agriculture and published in *The Philippine Journal of Science. Chemical and Geological Sciences and the Industries*, Vol. XII, Sec. A, No. 2, March, 1917.

The investigations are summarized under the following heads:

(1) "The study of copra and other coconut products" by J. Alvin Cox;

(2) "Copra and coconut oil" by Harvey C. Brill, Harrison O. Parker and Harry S. Yates;

(3) "Methods for the production of pure coconut oil" by Harrison O. Parker and Harvey C. Brill;

(4) "The rancidity of Philippine coconut oil" by Harvey C. Brill and Harrison O. Parker.

In the Philippine Islands, copra and coconut oil rank among the three most important exports and represent about one-third of the world's output of copra. Early in 1917 there were two large operating oil expression plants in the country while several smaller ones were being erected or planned. The quality of Philippine copra, which appears to be almost entirely manufactured by natives of the country, is, however, comparatively poor and is said to be quoted as the lowest in the world's market.

Preparation of Copra and Dried Coconut Meat.

A process of treating the fresh meat with sulphur dioxide fumes by the burning of sulphur, as used in the case of fruits in California, in order to prevent mildewing during drying and transport, has been applied successfully and is, in the writer's opinion, likely to be of considerable value in the preparation of a pure white copra, if the manufacture of this product is continued.

In comparison with the native grill method of drying, the process is said to be as economical, the copra is preserved and is of an excellent white colour while there is no loss of oil during treatment or during drying; the keeping quality of the copra is improved and the oil expressed from such copra is colourless, free from rancidity and said to be equal to the best Cochin oil, which fetches the top market price.

Other experiments are being carried on, as in Malaya, with the idea of eliminating the manufacture of copra and expression of the oil from the fresh coconut meat.

One factor, in the Philippines, which has militated against the production of a copra of higher quality is that good and bad grades are mixed together and that there has been insufficient of the former to enable any mill to run on good quality material.

Copra Standards.

In connection with the marketing of copra, better methods of classification and standardization are necessary. In the event of the inauguration of co-operative oil mills in this country, this would be essential and would probably be carried out best by paying a premium on the oil-content in excess of a definite percentage, as is done in the Philippines by one mill.

It must be remembered, however, that the character of copra depends on the variety of nut, the ripeness of the nut, the amount of free fatty acids in the oil, which represent deterioration of the oil and loss of a certain amount of an important bye-product—glycerine. It is of importance to note that oil-content alone cannot be taken as a criterion of quality, unless this is done in relation to other qualities such as cleanliness, ripeness, moisture-content, etc.

One important observation made in connection with the investigation on the effect of mould growth on badly dried copra in the Philippines was that the real loss of oil due to growth of moulds is much greater than the apparent loss of oil, since the moulds in general decompose the carbohydrate constituents as well as the oil.

Cause of Poor Quality of Copra.

Although the results quoted in this paper are those obtaining in the Philippines the writer is positive that the causes contributing to any inferiority of copra in that country are applicable also to Malayan copra. The poor quality of copra is due almost entirely to bad methods of preparation, chiefly insufficient and badly regulated drying and lack of cleanliness, which leads to deterioration both in the quantity and quality of the coconut oil. The deterioration in quality is indicated chiefly by a high content of free fatty acids, which should not exceed 5 per cent. and in the best oil is well below 1 per cent.

The poor quality of coconut oil prepared from deteriorated copra is the principal reason which operates against its use in the preparation of edible vegetable butters, for which purpose any oil has a higher value than for the manufacture of soap, candles, etc.

Unless the fresh coconut meat is dried quickly to a moisture-content of not more than 6 per cent. it is liable to attack by numerous micro-organisms, the spores of which are invariably present in the atmosphere, causing a loss of oil; the extent of this loss depends on the period during which sufficient moisture is present for mould growth.

It has been found in the Philippine investigations that moulds grow most luxuriantly on copra with a moisture-content of at least 10 per cent., which is a common percentage in commercial copra.

Samples of commercial copra in the Philippines from various sources, varied in moisture-content from 10.4 to 29.1 per cent.

Laboratory experiments on storage of copra with a moisture-content of 10-20 per cent. showed a loss of 25 per cent. in the total oil-content.

The following table (I) contains results obtained on partially dried copra stored at room temperature for 15 days, regulating the moisture-content at 10-20 per cent., under which conditions four of the common moulds (green, brown, black and white moulds), which attack copra, are present:

TABLE I.

Ref. No.	Loss of oil.	Acidity of oil as oleic acid after mould action.
	Per cent.	Per cent.
1	24.9	15.6
2	25.2	12.4
3	24.3	13.0
4	23.8	9.0
5	28.1	11.4
6	25.6	10.0

NOTE.—Acidity of oil from fresh coconut meat is stated to be always about 0.2 per cent., calculated as oleic acid.

A loss in oil on storage must also represent a loss of copra, apart from the loss due to the destruction of other constituents of the copra by the moulds.

The following table (II) shows a few of the results obtained in the Philippine investigations, the copra being stored under normal storage conditions:

TABLE II.

Ref. No.	Number of days stored.	Loss in weight.
		Per cent.
1	29	9.6
1	10	6.0
1	22	1.0
2	28	0.0
2	31	6.25
3	26	10.07
3	20	1.5
4	19	16.6
4	14	2.0
5	28	17.7
5	19	1.75

The above table indicates wide variations in the losses, evidently due to different conditions of storage.

There is said to be a further loss on board ship amounting to from 3-6 per cent. With high freights this also represents a considerable loss due to paying freight on loss of weight. In this connection the producer suffers, since the buyer reduces the price to cover losses and the purchaser at home buys on weight received.

It has been proved also that these losses in weight are not due to further drying and therefore do not represent only loss of moisture.

It has been shown definitely that under different conditions of storage there is a considerable rise in temperature and production of carbon dioxide in proportion to the rise in temperature, proving that slow combustion of the copra is taking place.

Well-dried copra on storage neither becomes heated nor develops carbon dioxide, showing that combustion is due to an excessive quantity of moisture combined with mould action.

Only in exceptionally bad copra is the oil-content apparently less than in good copra, due to the fact, as stated previously, that other constituents as well as the oil in the meat are attacked and destroyed, thus lowering the total weight of the material.

It is essential therefore to ascertain the total oil present in the original fresh meat, in order to find the percentage of total loss.

The following table (III) shows the apparent and true loss of oil in various samples investigated:

TABLE III.

	Sample No.				
	1	2	3	4	5
Dry meat before mould action, calculated ... ... (grms.)	13.6	11.8	13.2	16.2	13.3
Dry meat after mould action, calculated ... ... „	11.8	10.2	11.8	14.4	12.0
Oil in dry meat before mould action, calculated ... ... (per cent.)	67.5	67.5	66.8	66.8	66.8
Oil in dry meat after mould action, calculated ... ... „	53.6	54.6	49.6	47.1	46.7
Total oil before mould action ... (grms.)	9.1	7.9	8.8	10.8	8.9
„ after „ „ ... „	6.3	5.6	5.8	6.8	5.6
Apparent loss of oil from percentages... ... ... (per cent.)	13.9	12.9	17.2	19.7	20.1
True loss of oil from percentages „	30.7	29.8	33.7	37.2	36.8

It is seen that the true loss of oil is much higher than the apparent loss, since the apparent loss does not take into account the destruction of carbohydrate or cellulose constituents.

If the destruction of these other constituents is not taken into account, the apparent loss of oil by examining only mouldy samples may appear negligible or the oil-content may even be higher than that of the sample before mould action.

THE EFFECT OF MICRO-ORGANISMS ON COPRA AND COCONUT OIL.

When exposed to the air, fresh coconut meat, like most other vegetable substances, is attacked by various fungi and bacteria and certain fungi disappear and are succeeded by others as the moisture-content of the material decreases.

Certain fungi are always found on fresh meat and others on fairly dry copra and it appeared that each fungus might be restricted to a definite moisture condition in the copra. The life history of several of the most important fungi found on copra was studied in order to ascertain whether each had a different effect on the oil; special attention was paid to rate of growth, moisture requirements and effect on the oil.

It was found also that both fungi and bacteria were concerned in the deterioration of copra and coconut oil, although the latter play only a minor rôle, since a moisture-content sufficiently high for bacterial growth is not found in ordinary copra. The bacteria on copra were also found to cause little, if any, loss of oil even under conditions most favourable to their growth, although they seriously affect the appearance of the copra and the quality of the oil.

Attention was therefore paid to the fungi, which play a more important part in the deterioration of the oil in copra than do bacteria.

Copra containing less than 20 per cent. of moisture is said to be practically free from bacterial action, while the moisture requirements of the fungi present are much less than those of the bacteria.

Further, if mould action is prevented, bacterial action is prevented at the same time and by similar methods.

Four moulds have been found to appear constantly on copra and coconut meats and the spores of these moulds vary considerably in colour and enable the fungi to be distinguished macroscopically.

The moulds are: (1) *Rhizopus* sp. (white mould) with black sporangia occurring on fresh meat or copra of the highest moisture-content; (2) *Aspergillus niger* (black mould) with black spores giving a black appearance on copra with a relatively high moisture-content; (3) *Aspergillus flavus* (brown or yellow mould) with greenish-yellow spores turning brown—the most common mould on copra; (4) *Penicillium glaucum* (green mould) with green spores, common on copra especially with a low moisture-content.

White Mould (Rhizopus sp.*).*

White mould occurs only on fresh coconut meat and then only when the surrounding atmosphere is nearly saturated with moisture. Under these conditions the growth of this mould is luxuriant and in 36-48 hours the mycelium with sporangia frequently entirely covers a piece of coconut 10 cms. in diameter. The spores germinate in about six hours in coconut decoction.

Although this mould grows rapidly and can destroy a large percentage of oil, it is probably the least important of the four moulds under consideration, since its growth is checked as soon as drying commences.

Oil loss.—The following table (IV) shows the oil loss due to the action of this mould on grated coconut meat previously sterilized and inoculated with the spores of the mould in a saturated atmosphere during a period of ten days:

TABLE IV.

No. of sample.	Loss of oil.	Acidity of oil as oleic acid.
	Per cent.	Per cent.
1	43.1	21.0
2	36.4	19.8
3	41.0	26.6

It should be stated that in the above experiment, the conditions were the most favourable for the action of the mould.

Black Mould (Aspergillus niger).

This species of fungus plays a more important part than white mould but less important than brown mould (*Aspergillus flavus*). It is the black mould often seen on badly moulded copra. Its moisture requirements are intermediate to those of white and brown mould and it appears only on copra containing at least 12 per cent. of moisture and grows most luxuriantly on copra of 18-20 per cent. moisture-content. Properly dried copra, therefore, should not be attacked by this mould, although it is present on much of the Philippine copra.

It causes an appreciable loss of oil which may amount to 40 per cent. of the total oil.

The spores germinate in about six hours and subsequent growth is rapid, the mycelium from a single spore may extend over an area of 3-4 cms. in diameter within 48 hours.

Oil loss.—The following table (V) shows the oil loss caused by the action of this mould on grated copra in a saturated atmosphere during a period of ten days:

TABLE V.

No. of sample.	Loss of oil.	Acidity of oil as oleic acid.
	Per cent.	Per cent.
1	51.3	9.5
2	23.0	8.0
3	13.0	2.9

The wide variation in loss of oil is due to the extent of the mould growth. The acidity developed is also too high for coconut oil of good quality, but is low in comparison with that produced by white and brown mould.

Brown Mould (Aspergillus flavus).

This species is the mould which plays the most important part in the destruction of oil in copra and is the brown mould usually seen on badly moulded copra. In many cases it is mixed with black mould (*Aspergillus*) mentioned above and often with green mould (*Penicillium*) mentioned later.

It occurs on copra with a moisture-content of 7-8 per cent., and, on account of its ability to grow on copra of this moisture-content, it destroys a large percentage of copra and may destroy up to about 40 per cent. of the total oil-content of the copra.

The oil from copra attacked by this fungus also contains a high percentage of free fatty acids.

The spores germinate in 4-5 hours, the mycelium is visible in 12-15 hours and mature spores are produced in about 48 hours. The growth from a single spore is slow compared to that of white or black mould, but the early production of spores leads to a rapid reproduction and the mould in a short time will completely cover the surface of a piece of copra.

Oil loss.—The following table (VI) shows the oil loss caused by this fungus, when allowed to grow on pieces of copra for a period of one month :

TABLE VI.

No. of sample.	Loss of oil.	Acidity of oil as oleic acid.
	Per cent.	Per cent.
1	30.7	6.8
2	29.8	5.1
3	33.7	7.7
4	37.2	7.2
5	36.8	6.5
6	37.0	7.0
7	20.9	5.8
8	40.3	9.1

The original acidity of the oil from the copra, before being attacked by this fungus varied from 0.56 to 0.9 per cent., calculated as oleic acid.

Green Mould (Penicillium glaucum).

This species is the common green mould often seen on copra; it grows on copra containing a very low percentage of moisture. Analysis has shown, however, that it destroys very little of the oil and produces very little free acidity. Its growth also appears to be largely superficial and it can be removed easily by brushing, leaving a clean white surface.

A growth of green mould may be said to almost indicate a good copra, because it grows on copra with a moisture-content of 5-7 per cent. and causes no loss or deterioration of oil. This mould, however, is also capable of growing with the other moulds mentioned, on copra of a higher moisture-content and owing to its presence with other moulds loses its significance. The reason for its general non-appearance on copra of a high moisture-content is attributed to its slow growth. The spores germinate in about $6\frac{1}{2}$ hours, but subsequent growth is slow and colonies on copra do not become visible to the naked eye till from 24-36 hours later. The colonies grow very slowly and mature colonies from single spores are rarely more than 1 cm. in diameter.

The spores are mature in about 11 hours after the mycelium becomes visible.

Owing to the more rapid growth of the other three fungi mentioned, green mould is crowded out or covered by them and only after the other moulds have stopped growing due to unfavourable conditions does *Penicillium* become visible.

Oil loss.—The following table (VII) shows the effect of green mould on the oil-content and free acidity of the oil from copra attacked by it for a period of 30 days:

TABLE VII.

No. of sample.	Loss of oil.	Acidity of oil as oleic acid.
	Per cent.	Per cent.
1	0.20	1.2
2	0.69	1.0
3	0.87	0.9
4	0.54	0.75

The original acidity of the oil before the inoculation with *Penicillium* amounted to 0.79 per cent., calculated as oleic acid.

The above experiment also was under the most favourable conditions for the growth and action of the fungus.

Moisture-content of coconut meat.—In the Philippine investigations it was found that while the total moisture-content of the meat might be as low as 5 per cent., the upper portion (to a depth of one-fifth the thickness), *i.e.*, the meat nearest the interior, or in contact with the "water" of the nut, might be nearly saturated. This is important, because the upper portion of the meat is the first attacked by fungi.

It is difficult to obtain exact data as to the water-content necessary for mould growth, owing to the difficulty of obtaining a uniform sample of the upper layer.

The following table (VIII) gives approximate values for the moisture-content of the separate layers:

TABLE VIII.

Moisture (per cent).

No. of sample.	Upper layer.	Inner layer.	Whole sample.
1	13.36	6.4	7.6
2	21.52	7.8	8.8
3	20.43	8.9	10.7
4	11.3	6.5	8.0
5	24.0	6.8	12.5
6	10.9	5.7	7.9
7	10.5	7.6	8.4

The moisture-content of the whole sample would indicate that in general the copras were sufficiently dry to resist mould attack, whereas the upper layers contain generally sufficient moisture percentages to support the growth of the more destructive moulds.

Heating of Copra and Mould Growth.

In piling mouldy copra in large quantities it was observed that the temperature rose to a maximum of 50°C. and then decreased; experiments were carried out to ascertain whether the subsequent fall in temperature was due to the effect of the heating on the fungi and their spores. There was no subsequent rise in temperature, such as would be expected if the spores had not been destroyed.

Experiments on the effect of heating to this temperature showed that both the mycelium and spores of the four moulds survive a temperature of 50°C. for a period of 9-12 hours.

Absorption of Moisture by Copra.

Investigations were also made to ascertain whether properly dried copra, kept under suitable conditions would absorb sufficient moisture to allow subsequent mould growth to take place (*N.B.*—This has already been shown by the writer to take place in raw rubber, in the case of certain chromogenic organisms which attack this product.) The point is of considerable importance in connection with the drying of copra, if, during subsequent storage and transport, the copra again absorbs moisture.

The results of the Philippine investigations show generally that when copra is dried to a 6 per cent. moisture-content, it does not again mould when stored in a place with a circulation of air; but when kept in a saturated atmosphere it will absorb sufficient moisture for subsequent development of mould.

It is considered very improbable that such conditions would exist for any length of time in either a warehouse or the hold of a ship and if such absorption does occur, that the humidity of the storage place will be again renewed or last for as long a period as even a week.

Copra dried to a moisture-content of only 7.5 per cent. will often not develop mould in the open air, probably because the surface is really drier than this, but when stored under bad conditions will develop moulds in 2-5 days.

Another factor, which has an influence, is the water liberated during the growth of the mould, due to the water and carbon dioxide liberated from the copra at the expense of the oil and cellulose, etc.

The following table (IX) shows the absorption of moisture by pieces of copra kept in a saturated atmosphere at room temperature (29°C.) until mould growth appeared:

Table IX.

	No. of sample.			
	1	2	3	4
Increase in weight ... ... (per cent.)	5.3	4.9	4.2	3.7
Original moisture-content ... ... „	2.6	3.4	3.9	5.0
Total water-content at end of 8-12 days „	7.6	8.0	7.9	8.4

In one case, moulds appeared on the eighth day, in two cases on the tenth day and in the remaining sample on the twelfth day.

The following table (X) shows the moisture absorption of copra stored in the open air at atmospheric temperature:

TABLE X.

	No. of sample.				
	1	2	3	4	5
Total loss	1.2	6.0	0.47	0.76	0.40
Original moisture-content ... (per cent.)	6.8	11.7	5.37	5.66	6.70
Total original moisture-content at end of 46 days ... ... „	5.6	5.7	4.9	4.9	6.3
Total original moisture-content at end of 46 days (upper portion) ... ... „	9.4	8.8	9.0	8.7	9.1
Total original moisture-content at end of 46 days (lower portion) ... . „	4.5	5.0	3.8	3.8	5.4

The relative humidity of the atmosphere varied from 98.5 on the third day to 85.9 on the fortieth day.

At the end of 56 days, no mould growth had developed. The last ten days of the experiment were wet, during which moisture was absorbed by the upper portion of the meat, as shown by comparing the upper and lower portions.

These experiments show that copra stored in the open air will lose or gain moisture until in equilibrium with the atmospheric moisture and that the equilibrium point is about 5 per cent. moisture for copra.

There are only short periods when the air is saturated with moisture and unless the copra is stored in a saturated atmosphere no mildewing will take place.

Results obtained on machine-dried copra without mould, stored in sacks, show that no temperature changes occur where no deterioration of meat or oil occurs and that properly dried copra does not develop moulds when stored.

Copra, machine-dried and not cooled before storing in piles becomes hot and later often develops moulds. This is probably due to oxidation or slow combustion, with consequent release of moisture, due to decomposition of oil and cellular tissue, sufficient to induce growth of the moulds.

COPRA-DRYING METHODS.

The methods of preparing or manufacturing copra in the Philippines are very similar to those in vogue in this and other tropical countries.

The methods are (1) sun-drying, (2) kiln-drying in open or closed kilns.

The sun-drying method produces better copra than the open, kiln method and consists merely in splitting the nuts and exposing the meat to the sun. The halved nuts are first exposed in order to cause the kernel or meat to shrink from the shell and render it more easily removable. The meat is then subjected, after removal from the shell, to further sun-drying.

The open kiln or grill method, used chiefly by Asiatic smallholders in this and other tropical countries, consists in husking and splitting the nuts, which are then placed on bamboo grills, under which husk and shells are burnt. Sometimes sun-drying and kiln-drying methods are combined, if the weather is favourable for the former.

The finished copra from the open kilns often contains at least 20 per cent. of moisture and is therefore very liable to attack by fungi.

Samples examined in the Philippines varied in moisture-content from 20.52 to 28.77 per cent.

The open kiln method also precludes the use of such copra for the manufacture of oil for edible purposes, owing to the creosote and other smoke products absorbed by the copra from the kilns. Complete drying by this method takes 4-5 days and gives a badly smoked product. Very uneven heating also results, the copra in contact with the grill becoming over-heated.

Closed kiln and hot air-driers.—Artificial drying by means of closed kilns, in which the pieces of fresh meat are distributed in a thin layer over floors made of iron plates or of concrete, below which the fumes from fires at one end of the kilns are drawn or forced, are in use on some large estates in this country. The drying is assisted by again drawing or forcing the hot fumes from the further end of such kilns through large ducts immediately above the layer of copra.

Artificial driers, such as the Chula or Colombo drier, in which the temperature is raised to about 160° Fah. or higher, are also in use. These consist of chambers in which the copra is placed on a series of super-imposed trays, erected on a trolley, which can be easily run into and out of the chambers. The chambers are connected with an exhaust fan to remove the moisture-laden atmosphere. The shells and husks provide all the fuel necessary for the drying operations.

Mechanical Driers.

Mechanical driers, both in this country and the Philippines, have not been introduced on a commercial scale, although one estate in the Federated Malay States has just erected one of these driers which consists essentially of an endless travelling belt or conveyer carrying perforated trays through a specially heated chamber, into which air, heated by passing over steam pipes, is forced.

The final product from such driers is undoubtedly of superior quality, especially for the manufacture of oil for edible purposes.

Hot air-driers are also employed by oil mills in this country for finally drying the copra before milling for manufacture of the oil.

It is stated that mechanical driers have been discredited by the public, through the belief that, when coconut meat is dried in a current of hot air, a part of the oil is carried away, but this is not in accordance with what would be expected from the physical properties of coconut oil and has been disproved by the Philippine investigations.

It is possible that oil might be carried away (steam distilled) by the moisture, especially at a high drying temperature and by rapid removal of the moisture.

Experiments, however, on this point, showed that no such losses occurred.

Samples of fresh coconut meat were dried at different temperatures and the temperatures at the entrance and exhaust noted. The air was removed by a vacuum pump and passed through vessels containing oil solvents, but no oil was found in this air.

The following table (XI) shows the results obtained:

TABLE XI.

Experiment.	Temperature. °C.	Total loss of weight.	Oil loss.
		Moisture (Per cent.).	Per cent.
1	70	40.0	0.0
2	80	42.0	0.0
3	90	41.0	0.0
4	100	44.0	0.0

The losses, which are stated to have been found in Ceylon, are not ascertained losses of oil, but probably different states of drying of the copra.

In support of the contention that no oil is lost, the Philippine investigations recorded in the following table (XII), show the high oil-content of artificially dried copra, obtained by different methods:

TABLE XII.

No. of sample.	Method of drying.	Oil in anhydrous copra.	Water.
		Per cent.	Per cent.
1	Vacuum drying (14 cms.) 9 hours ...	—	—
2	" " ...	74.1	6.4
3	" " ...	70.7	7.3
4	" " ...	71.3	7.1
5	" " ...	73.7	4.0
6	" " ...	69.1	5.2
7	" " ...	72.9	3.9
8	" " ...	68.0	4.7
9	Hot air drying over 80°C. 17 hours ...	71.5	5.3
10	" " ...	71.2	0.9
11	" " ...	70.8	5.8
12	" " ...	69.9	9.1
13	Hot air drying over 90°C. 17 hours ...	72.2	5.4
15	" " ...	68.5	5.1
16	" " ...	69.0	7.5

The following (Table XIII) oil and moisture-contents were obtained by the writer from fresh grated meat artificially dried in a hot air-chamber at about 160°Fah., on travelling conveyers.

The different moisture-contents are due to leaving the grated meat in the chamber for different periods.

The table also shows the moisture-content of the dried grated meat after expressing in the cold 50 per cent. of oil by means of a small cylindrical laboratory press, working at a pressure of about 1 ton per square inch.

It is interesting to note that the moisture-content of the residual cake is approximately double that of the original meat, showing that none of the water has been expressed with the oil.

TABLE XIII.

No. of sample.	Original dried grated meat.		Expressed dried grated meat after removal of approx. 50 per cent. of oil by cold pressing.	
	Moisture.	Oil.	Moisture.	Oil.
	Per cent.	Per cent.	Per cent.	Per cent.
A	3.77	63.4	...	...
B	2.95	63.4	...	...
C	...	...	5.45	31.4
D	8.83	60.4	...	...
E	...	...	17.94	47.1
F	5.74	60.0	...	...

NOTE.—C represents sample B after expression of 7.4 ozs. of oil from 1 lb. of meat.

E „ „ D „ „ of 3.2 ozs. of oil from 8 ozs. of meat.

It would be of interest to know the optimum amount of moisture in the crushed or grated meat for the most efficient removal of oil by hot and cold pressing. No data on this point appears in any of the existing literature.

Working with the small laboratory press in the cold, the writer found that the oil removed from dried grated meat containing about 9 per cent. of moisture was about the same as from similar material dried under similar conditions to a moisture-content of 3 per cent.

This is a point of considerable importance in the economical working of artificial driers for grated fresh meat, which can be conveyed while still hot direct from the driers to the hydraulic presses or oil expellers. The higher the moisture-content which can be allowed, with efficient expression of the oil, without at the same time removing water with the oil in the presses, the greater the capacity of the artificial drier and the more economical its running costs. The writer hopes shortly to be able to carry out further experiments on this point.

Treatment and Preparation of Copra with Sulphur Dioxide.

The Philippine Bureau of Science has also developed a method for the preparation of a high grade copra by treatment with sulphur dioxide and allowing the meat to dry without the addition of artificial heat, the treatment with sulphur dioxide preventing the growth of moulds during drying.

This method appears to be of sufficient importance to merit a full description.

The apparatus used is a wooden box, provided with trays with split bamboo bottoms, and a 4-wheel car consisting of framework and two pairs of small iron wheels, mounted on a wooden track. The box is about 40 inches × 80 × 106 inches, and is provided with a door at one end, and is of sufficient capacity to hold twelve trays separated for free circulation of the gas and with a capacity for 1,200 nuts. The track is twice the length of the box to facilitate loading and unloading of the car outside the box. The husked nuts are halved and spread on the trays, concave side downwards, and the trays loaded on the car and pushed into the box. Eight kilogrammes (= 18 lbs.) of sulphur are placed in a shallow pit under the car and ignited. If the box is fairly air tight, this amount of sulphur will burn from 10-12 hours, producing sufficient sulphur dioxide for the treatment. (*N.B.*—The maximum amount of sulphur dioxide which the coconut meat will absorb was not determined. A twelve hour continuous treatment was found, however, to be sufficient in all cases.)

The car is then removed from the box and the meat removed immediately from the nuts by means of a copra knife or may remain in the shells for 4-5 days at the end of which it is sufficiently dry to allow of its ready removal.

In either case, the product is spread out under cover with free access of air for a period of two weeks and is then cut up and sacked for the market.

On sunny days, the meat may be spread in the open to facilitate the drying.

The following table (XIV) shows the sulphur dioxide and moisture-content of the copra at various periods of treatment:

Table XIV.

Hours treated.	Sulphur dioxide (per cent.).			Moisture (per cent.).				
	Immediately after treatment.	After 10 days.	Loss of SO_2 during 10 days.	Fresh meat.	Immediately after treatment.	Loss in total during treatment.	Ten days after treatment.	Loss in total 10 days after treatment.
6	0.1218	0.0412	66.2	47.7	42.2	14.2	13.1	73.1
9	0.1456	0.0425	70.8	46.1	41.7	15.5	12.6	72.9
13	0.1869	0.0672	64.1	49.2	37.2	27.0	13.7	73.0
18	0.2114	0.0722	65.9	48.9	39.0	23.0	11.1	81.1
24	0.3144	0.0715	77.3	48.5	45.1	15.9	8.0	82.1

The sulphur dioxide serves a double purpose. It destroys the mould spores in the copra and a sufficient amount is retained by the meat during the time necessary for the moisture to escape, to prevent the growth of new spores.

In the experiments quoted above, the copra during the 10 days' drying was under cover, and drying was in no case hastened by exposing to the sun or artificial drying. The amount of sulphur dioxide retained after one month was negligible and may be disregarded. The copra prepared by this method and dried within two weeks, is clean and white and free from moulds, and the oil from such copra is practically colourless and free from rancidity and acidity. No sulphur dioxide was detected in the expressed oil.

It is stated that, with proper organization, the labour costs should not exceed that of the kiln or sun-drying methods and the initial outlay is small.

Unless sun-drying is used subsequent to the sulphuring, the copra should be kept for two weeks before marketing. The expense of sulphuring is very small, when the superior quality of the copra is taken into consideration.

The oil should require no refining, to free it from fatty acids, rancidity and colour; refining is said to cost, in the case of commercial coconut oil, 16*s.* 8*d.* or say $7 (Straits) per 1 per cent. free fatty acids per ton of oil.

Further Notes on Improvement of Copra.

Ripe nuts only should be used in the production of copra, since unripe nuts contain less oil. It is not practicable, however, here and in the Philippines, as is done in other countries, to allow the nuts to fall from the trees, as an evidence of ripeness, since some varieties do not fall until over-ripe.

The nuts, after opening, should be kept free from dirt and dried immediately and without smoking, to a moisture-content of 5 per cent.

Standardization and classification of copra is a difficult proposition, owing largely to the difficulties in sampling and the factors involved, *e.g.*, oil-content, moisture, acidity and appearance.

At present, however, little discrimination is said to be made, between good and bad copra and this lends no encouragement to the preparation of a superior grade; this is due largely, however, to the comparatively small quantities of good copra available, which must be sold with the poorer qualities.

The Manufacture of Pure Coconut Oil.

It is interesting to note that in the Philippines as in this country, attention is being directed to the manufacture of coconut oil direct from fresh nuts, in order to eliminate the preparation of copra, and its deterioration and loss in quantity and quality of oil. It must be borne in mind, however, that the manufacture of the oil necessitates large mills for economic working and none of even the largest European-owned estates in this country are of sufficient capacity to support a hydraulic mill, although it would appear that plants of the Expeller type (the Anderson Oil Expeller) may prove of considerable value in the case of some of the larger European-owned estates. In the case of Asiatic small-holders, however, a co-operative mill, under

Government auspices, a mill run entirely by the Government or by private enterprise is essential. The drawback to such a mill, especially in the case of small-holders, would be the difficulty of relying on regular supplies of copra from such sources.

Crude methods of manufacture.—One method of obtaining oil from fresh nuts, practised in the Philippines is to husk the nut and then split into halves and remove the meat by grating it in the shell by means of a steel burr driven by a pedal attachment. The same operator holds the half nut and works the burr. (NOTE.—A method similar to this has been patented recently in this country, but since the method, as practised in the Philippines is known to others interested in the coconut industry, the validity of such a patent is doubtful, unless it consists of an improvement on the original.) The grated meat is then transferred to a steaming kettle, mixed with half its volume of water and steamed for 2-4 hours by direct heat from burning shells and husks. The steamed meat is placed in rattan bags, suspended in a vertical position between two heavy pieces of wood and pressure applied by means of a wooden vice screw. The white emulsion of oil water and tissue is returned to a second kettle and the water evaporated and the cellular tissue, sugars, etc., extracted by the water are evaporated and coagulated to a brown mass. This brown residue, which has a high protein-content, is used as a food by Filipinos. The oil is ladled into earthenware vessels and any small particles of albuminous matter, etc., allowed to settle out. No filtering of the oil is carried out. This oil is used chiefly for edible purposes. This process may be described essentially as a boiling process.

The residual cake is shaken through a bamboo basket to disintegrate it and is then allowed to ferment for three days, with occasional stirring to facilitate the fermentation. The fermented meat is again ground by means of a heavy roller working backwards and forwards on a flat surface and is then re-pressed.

Fermenting and re-pressing is carried on again daily from 5 to 7 consecutive days. All the oil from the fermented cake is rancid and only of value for soap making and similar uses. The poonac is used for feeding pigs.

The edible oil obtained in the first expression on unfermented meat represents only about one-third of the total oil-content.

The following table (XV) shows the amount of oil in the cake after various pressings:

TABLE XV.

—	Oil in cake.
	Per cent.
After 1st expression (unfermented meat)	44.18
„ 2nd „ (fermented „)	36.68
„ 4th „ („ „)	30.68
„ 5th „ („ „)	27.69
„ 7th „ („ „)	23.90
Acidity of oils as oleic acid (edible oil)	0.6
„ rancid oil after 5th expression	9.5

A patented method, reported from British North Borneo, for treating fresh nuts is also described. This involves the use of modern machinery and can deal with 10,000 nuts daily.

The meat is removed from the shell by means of a one-man-operated machine, with a capacity of 25 nuts per hour. [*N.B.*—This does not appear very promising as a rapid commercial producer B.J.E.] The meat is carried on an endless chute to roller crushers and thence to grinder and converted into a fine state of division. It then passes into a large tank and is mixed with a definite quantity of pure water (amount?). The mixture is then run into a boiler and heated (temperature?) for a certain period (time?). The boiled mixture is passed over a coarse strainer and the emulsion passes into a container and from thence is pumped into an evaporator and heated, until the oil separates from the liquid, when it is drawn off. The pulp is subjected to high pressures and the resulting liquid also added to the emulsion first obtained.

Experiments carried out on these lines by the Philippine Bureau of Science were not successful.

It was also found that freshly grated coconut meat would not give up oil readily by pressing; at a pressure of 1,000 lbs. per square inch, over 60 per cent. of the total oil remained in the cake. By treating the meat, however, with water and live steam for three hours before pressing, 80 per cent. of the total oil was removed in one pressing. The liquid obtained from this product is a white emulsion consisting of oil, water and cellular tissue. The quality of the oil, however, obtained by heating the emulsion even under reduced pressure is not good, since the oil becomes coloured and has a burnt taste and odour. It is suggested that a centrifugal cream separator might effectively attain the desired object, *i.e.*, separation of the oil and water, although one drawback is the presence of solid particles of cellular tissue, etc.

The writer was unable to obtain satisfactory results by centrifugalizing the cold white emulsion of oil and water, etc., although a large part of the water separates on standing; in fact by allowing the emulsion to stand overnight on ice, most of the oil can be removed on the following day by creaming. Micro-organisms also break down the tissue in the emulsion and liberate oil, but this is slow and the oil liable to be very acid.

Attempts to evaporate the oil from the emulsion by treatment with (*a*) salts, (*b*) acids, (*c*) alkalis have not been successful and the quality of the oil was impaired.

Freshly grated meat, heated in an autoclave at 120°-130°C. up to four hours, with and without the addition of water did not yield improved results over ordinary steam.

Experiments with 10 per cent. sodium sulphite solutions to disintegrate the cellular tissue (cp. treatment of wood for paper pulp) facilitates removal of the oil, but impairs the oil for edible purposes.

Laboratory experiments, which could be worked on a commercial scale, have shown that the meat can be removed from the shell and brought to a fine state of division for expression by (1) grating out

the meat by means of the revolving burr (one man is said to be able to treat 100 nuts per hour, but the writer believes from what he has seen in this country, that this machine has a much smaller capacity); (2) freeing the meat from the shell by steaming the nuts for 15-30 minutes, using waste steam from boilers. The nuts are opened and the meat is readily removed by means of an ordinary copra knife and ground in the machinery used for copra. This meat is more finely divided than the grated product. The ground meat is then placed in a cooking vat, and treated with live steam and mechanically beaten, mixed with an equal quantity of water and heated and agitated for three hours. The white emulsion formed is strained off and together with that obtained by pressing the treated meat, is run into a storage tank and cooled to 15°C. for 24 hours.

By freezing in this way, the water separates, and leaves a solid layer of fat and cellular tissue, while fermentation is prevented. The water is drawn off and the solid layer is melted by gentle heat or standing.

The freezing and melting rupture the cells and allow the oil to separate. The oil is then passed through a filter press, sterilized by heating at 100°C. for 30 minutes and stored in air-tight containers.

The oil prepared in this way is stated to be water white in appearance, and free from acidity and rancidity. Its keeping qualities, even without sterilization, are superior to those of copra oil.

This process is essentially a boiling process.

Manufacture of Coconut Oil from Dried Grated Meat.

A second method for the production of pure coconut oil and a valuable cake from fresh nuts is similar to a method recommended independently and being adopted in this country.

This is a continuous process in which the meat is removed from the shells and ground as described by one of the methods given above and while still hot subjected to pressure to remove the oil. In the finely divided state the coconut meat can be dried in a current of hot air much more rapidly than when in pieces as in the preparation of copra.

The shredded coconut is dried on trays carried by endless belts or conveyers passing through a chamber through which hot air at 70°-80°C. is forced. The shredded meat can be dried to a 3 per cent. moisture-content in about 30 minutes and to a higher moisture-content in a shorter time. As stated previously by the writer, the optimum moisture-content for maximum oil expression, and to avoid forming an emulsion of oil, requires to be ascertained.

The writer's experience agrees with the Philippine investigations in showing that a 10 per cent. moisture-content is not too high; possibly a higher moisture-content may be equally good. The pressed cake, however, which the writer has found to contain all the moisture, and which has, therefore, after expression of the oil, more than double the moisture-content of the original meat (assuming a 55-60 per cent. oil expression) would require to be thoroughly air-dried to prevent mildewing.

The following table (XVI) shows results obtained in the Philippines by pressing freshly grated and partially dried coconut meat in a small press working at a pressure of 1,000 lbs. per square inch at a temperature of 80°-85°C.:

Table XVI.

No. of sample.	Time.	Loss in wt. on original wt.	Water in meat.	Extraction of total oil.	Oil in cake.	Water and cellular tissue in oil.
		Per cent.	Per cent.	Per cent.	Per cent.	
1	60	24.5	31.4	84.0	31.8	Much
2	90	36.0	9.0	87.0	24.7	Nil
3	60	33.2	16.4	87.0	29.9	Some
4	60	25.0	33.5	70.6	44.0	Much
5	90	39.1	25.6	76.4	27.4	Little
7	120	41.0	12.3	86.3	22.6	None
8	120	39.0	9.0	84.8	24.6	,,
9	90	30.2	5.6	89.4	22.5	,,

The above results appear to show that a moisture-content of about 10-12 per cent. is probably the most satisfactory, both for the most efficient extraction of oil and the avoidance of extraneous matter in the expressed oil. With a higher pressure, as used in practice (up to $2\frac{1}{2}$-3 tons per square inch) the expression of oil would be much greater and the amount of extraneous matter removed in the oil would be greater with meat containing the higher moisture-content.

One great advantage of this process is that very little handling is required, since the hot dried grated meat can be conveyed direct from the drying chambers to the cake-moulding machine and presses or expeller without any preliminary steaming in a steam-kettle. By employing machines of the expeller type, such as the Anderson Oil Expeller, the material is machine handled from the time it enters the drying chamber, till the oil has been expressed.

The Philippine investigators estimate that one expeller (type of expeller not stated, probably Anderson Oil Expeller) would be sufficient for a plant handling 45,000 nuts per day, giving an oil output of six tons.

The oil would be superior to probably the finest grades of coconut oil on the market at the present time, since it is water white in colour and free from acidity and rancidity. The residual cake, on account of its high quality and white colour, might also even find a market for human consumption as well as for stock-feeding purposes.

Samples of this cake stored in open and closed containers for several months underwent no deterioration in quality.

Recipes are given for the preparation of various food-products —bread, biscuits and cakes—from the residual meal. Some of these have been prepared by the writer and his wife and found to be excellent.

The writer is of opinion, from the results obtained in the Philippine investigations and from his own preliminary experiments and experience, that this last method of manufacture of a pure coconut oil from artificially dried grated coconut meat should prove a valuable industry in this country.

Machinery for the Manufacture of Coconut Oil.

In a further article on oil expression machinery, details of machinery for the manufacture of coconut oil are given.

Rancidity of Coconut Oil.

The rancidity of coconut and other vegetable and animal oils and fats has for a long time engaged the attention of scientific investigators. Although, generally, rancidity is associated with high free acidity, since both are due to the decomposition of the oil or fat, this is not always the case, and rancidity should not be confused with acidity, as is sometimes done. Free acidity in oils and fats can be removed by treatment with alkalis, which does not affect rancidity, while rancidity can be removed by steam distillation, *i.e.*, passing steam through the fat, and this treatment does not remove acidity.

The constituents formed in the oil or fat which give the peculiar odour described as "rancid" are not at present known. Rancidity is believed to be caused by the action of heat, light, moisture and air (oxygen).

Lewkowitsch, the well-known authority on oils and fats in England, states: "I ascribe the primary cause of rancidity, namely, the formation of free fatty acids, to the action of moisture in the presence of soluble ferments, which act as catalysts or accelerators . . . . Rancidity is not due, as is widely believed, to the presence of free fatty acids alone; in other words, rancidity must not be considered as coterminous with acidity . . . . It is only when oxygen and light gain access to the acid fats that the conditions favouring the setting in of rancidity, are provided. Rancidity is rather due to the direct oxidation of free fatty acids by the oxygen of the air, assisted and intensified by the exposure to light."

The presence of free fatty acids can be therefore considered only the first stage in the development of rancidity.

Dyer has shown that the prolonged storage of butter, causing a change in flavour, is due to slow oxidation of the non-fatty portions of the butter and it is considered by the Philippine investigators that the non-fatty portion of the oil influences greatly its qualities on storage.

Investigations are still in progress in connection with the nature of the constituents involved in rancidity of coconut oil.

The results obtained in the Philippines confirm the statement that the acidity of the oil is not a measure of the rancidity. Tests carried out with two reagents recommended for tests of rancidity also gave contradictory results in the case of oils known to be rancid or free from rancidity by their odour. In a total of 48 oils examined by means of four tests for rancidity, one or more of these tests did not agree with the others in 30 cases.

High acidity was found to be a more reliable indication of rancidity than the reactions with the two chemical reagents employed, but this must not be taken to infer that rancidity is coterminous with acidity, only that they often occur simultaneously. If oils of high acidity are steam distilled, the residual oil is found to have lost its rancidity but very little of its total acidity.

The milk from the coconut is said to contain both oxidase and peroxidase enzymes but these are not found in the fresh meat and their presence in such meat is probably due to contact with the milk. Copra attacked by moulds, however, contains oxidizing enzymes which may be separated in the oil and may have an important influence on rancidity.

Tests for such enzymes in various rancid oils, however, gave contradictory results. Tests for lipase (fat-splitting enzyme) in the fresh meat were negative and did not confirm the results of other investigators. Further work is required on this problem and is being carried out by the Philippine Bureau of Science.

It may be added that, if coconut oil is prepared in this country by the method indicated previously, *i.e.*, expression of the oil from the artificially dried grated meat, the product is unlikely to develop rancidity or acidity under proper storage conditions.

AGRICULTURAL DEMONSTRATIONS TO MALAYS.

By D. H. Grist.

IN a previous issue of the *Agricultural Bulletin, F.M.S.* (Vol. VI, No. 4, p. 195) an account was given of the visit of certain Malays of Negri Sembilan and Pahang to the Government experimental grounds at Kuala Pilah. The writer concluded by hoping that it would be found possible to extend this form of instruction, by arranging for Malays to visit other experimental plantations of the Department of Agriculture. Since the publication of the article above referred to, a visit of Malays to the plantation at Kuala Lumpur has been held, and it is proposed in this article to give a short account of the results.

The importance of food production at the present time is realized by most Europeans, but with the lack of education amongst natives, and the few facilities they have of keeping themselves informed on current politics, the position as regards food-stuffs cannot be fully realized by them. Therefore it was desirable that natives should have an opportunity of being informed on the progress of agriculture in this country, especially with regard to the crops of particular importance at the present time, including those which have been introduced into this country, and especially those found to be suitable for native cultivation. Many of these crops are unknown to the Malays, or at least their cultivation is unknown. The proper cultivation of crops (with the exception of padi) is a weak point in native agriculture; most crops are not cultivated, but allowed to grow as best they can, the cultivator being grateful for any crop he may procure, but otherwise indifferent as to the fate of the plant. A particular point has therefore been made to impress on the natives the extreme importance of planting under the most advantageous conditions, and showing him by the example of crops produced on the plantations, that the extra time expended in so doing is worth the while, because of the superiority of yields. Results of the visit of Malays to Kuala Pilah in 1917, and the first of the visits to Kuala Lumpur demonstrate that the visits do bear fruit, and have done much to kindle interest and effort on the part of the natives towards the production of food-stuffs.

It should be pointed out that the Malays visiting the plantations on these occasions are carefully chosen by the District Officers. They are the heads of mukims, with a knowledge of the conditions peculiar to their country, and with influence over the Malays ("anak buah") of their mukim. Such being the case, they are competent to advise and instruct the Malays on the crops that can be grown to advantage in their districts. Furthermore, the fact that a particular Malay is chosen by the Government to be shown the work done, gives him a status amongst his dependents, and his advice will be received with the respect due to a man of such obvious importance. This may not always be the case, but is certainly a tendency. Another, by no means small, result of such meetings of Malays, is the opportunity it affords for an interchange of ideas amongst those forming the party. (In the Kuala Pilah party were found two men who had never previously left their districts and had never seen trains or motor cars.)

During 1918, two visits by Malays were arranged to be made to the Government experimental plantations at Kuala Lumpur. Much of the success of the first meeting has been due to the Agriculturist, Federated Malay States, Mr. F. G. Spring, who went round with the party and pointed out the details concerning the different crops grown on the plantations.

In the first of these visits, Malays from the Negri Sembilan and Pahang were invited. They were all Government officials, penghulu, lembaga or Malay Assistants. Each district in the two States sent representatives disposed as follows:

Negri Sembilan.—Seremban, 9; Jelebu, 5; Kuala Pilah, 6; Port Dickson, 6; Tampin, 3.

Pahang.—Pekan, 3; Kuala Lipis, Kuantan, Raub, and Bentong, 2 each.

The programme of the visit was as follows:

23rd July, 1918.

7 a.m.—Petaling Hill Plantation.—Demonstration of cultivation of 50 acres of various food-stuffs under "field conditions." Accounts given of cultivation, yields, and uses of the various crops. British cultivating implements explained and demonstrated.

11 a.m.—Agricultural Department.—Cereals and pulses, *Rubber*—its cultivation, terracing, drainage, planting, tapping methods, thinning out, etc.

24th July, 1918.

8.30 a.m.—Agricultural Department.—Root crops. Various economic products; fruits.

Demonstration of the extraction of oil by machinery. Rubber seed oil was thus prepared by Mr. B. J. Eaton, the Agricultural Chemist, Federated Malay States. Also demonstration of the vulcanization of rubber by Mr. Eaton.

25th July, 1918.

9 a.m.—Agricultural Department.—Fodder crops, grasses, plants used in paper making, and other economic crops.

The second of this series of visits was arranged to take place at Kuala Lumpur on 25th October, 1918, but was postponed on account of the prevalence of sickness throughout the country. On this occasion the Malays of Selangor were to have been taken over the same ground as detailed above.

On returning to their mukims, each Malay was requested to submit a report on his visit to Kuala Lumpur. The reports have been read by the writer with great interest. It is evident that some of the Malays lack the power of expression, and the report thus suffers, but the majority of the papers show that the writers have not only remembered a great deal of what they saw, but have been able to lay particular stress on matters of great importance. Thus the advantages of the use of iron agricultural implements is noted by many, who point out that it results in good cultivation of the land, combined with cheapness, and what to most Malays is most important, saves a considerable amount of time and trouble.

Results.—The results of such visits to Government plantations can be judged partly by the number of applications for seed. The 1917 visit to Kuala Pilah resulted in applications for padi seed that exhausted the entire crop available from the experimental plots of that year. It is difficult to judge with any accuracy the number of Malays now using seed obtained from the Department, but records are available showing that about 1,000 Malays of Negri Sembilan and Pahang are growing this padi. There were about 500 applications for tobacco seed. One cannot say the number of Malays that wish to grow vegetables, the seed of which is supplied from the Department, as in many cases the requests are grouped by the penghulu in sending forward the application, but as far as records show at present, the applications for "seed" are as follows.

Yams	84 applications	Artichokes ...	160 applications
Castor oil ...	3 „	Ragi	121 „
Pigeon peas ...	4 „	Brinjals	115 „
Giant millet ...	4 „	Sword beans ...	4 „
Italian millet	103 „	Cinnamon	14 „
Maize	129 „	Sweet potato ...	105 „

A total of 847 applications for various amounts of planting material. The stock of these crops has been insufficient to supply in every case, but it is expected that it will be possible to do so at a later date.

The above account gives but a rough account of the distribution of the "seed" of food-stuffs to Malays, but perhaps sufficient has been mentioned to indicate that the visits of Malay officers to Government plantations are not without result. It remains to be proved whether the Malays will cultivate the crops correctly and whether the results in this respect will justify the scheme. Possibly much seed will be wasted, but it is thought that the successful growers will stimulate further interest in food production, and thus by their example, prove to others the possibilities of careful cultivation of well-selected crops; so that the visits of Malay officers may have permanent effects.

FIELD EXPERIMENTS WITH HEVEA.

(1) PROBABLE ERROR IN FIELD EXPERIMENTS WITH HEVEA.

O. F. Bishop, J. Grantham and M. D. Knapp,

Archief voor de Rubber Cultuur, November, 1917.

(2) FIELD EXPERIMENTATION WITH HEVEA BRAZILIENSIS.

J. Grantham and M. D. Knapp,

Archief voor de Rubber Cultuur, September, 1918.

(3) RELIABILITY OF FIELD EXPERIMENTS WITH HEVEA.

J. G. J. A. Maas,

Archief voor de Rubber Cultuur, September, 1918.

THE first step in experimentation with any crop is the provision of a mechanism of control over errors.

In a previous communication* to this *Bulletin* have been discussed the peculiar difficulties attendant on experimentation with a perennial fruit-bearing crop, *e.g.*, coconuts and the urgent necessity for the collection of standard data over a protracted period has been indicated. It has also been pointed out that there is the same urgent need for similar data on Hevea.

Until comparatively recently many field trials with Hevea have been conducted in such a way as definitely to preclude the possibility of drawing conclusions concerning differences other than those of large magnitude. The fault has lain with the inadequacy of "control." In some instances blocks of land carrying Hevea have been placed directly under different treatments, and attempts have been made to deduce quantitative results from single experiments. Though this method of experimentation has now almost ceased to exist the method whereby blocks of trees are subjected to similar preliminary treatments the results so obtained being used directly to interpret the effects of altered conditions, still obtains. The danger of this method involving as it does a speculation on the length of the preliminary period necessary to obtain a constant index for control is well brought out by the data analysed by Messrs. Bishop, Grantham and Knapp. (1)

In this paper is discussed the necessity for the collection of standard data as a basis for field trials with Hevea and methods of arriving at the value of the expression known as the "probable error" are indicated.

In discussing the value of a determination of a probable error as a factor in control the authors show how peculiarly difficult are the errors involved in Hevea since unlike annual crops, age, time, and other factors are involved. The direct application of the "method of least squares" for the evaluation of a probable error from results obtained under similar treatment and the "percentage of the mean" method for dealing with the results of duplicate experiments are treated in detail.

* Observations on Experiments with Coconuts. *Agricultural Bulletin, F.M.S.*, Vol. V, No. 10 (1917).

The authors indicate the need for caution in directly applying preliminary yield data to interpret final results. They show that a preliminary yield-period of five months is not sufficient to provide an accurate index of subsequent yield (*see* data analysed for 10 blocks of Hevea in Table IX) and that the method militates against the possibility of drawing conclusions of an accuracy possible in actual practice.

(2) There is a wealth of data analysed in this paper. Here individual tree records, of over 1,500 trees are used for calculating probable errors for unit areas of 5's, 50's, 100's, and 200's variously disposed. For practical application the per cent. probable errors for these units are given as 11.0, 9.5, 6.9 and 5.0, respectively. The size of plot, number of duplications and practical limits of precision are discussed and "it appears that in general the plot size should be 100 trees yield to be calculated per unit tree and 6, 12 or 15 duplications used where a precision of not less than 10, 7 or 6 per cent., respectively, is required."

The paper also discusses the utilization of the rule of relative reliability varying inversely with the squares of the probable errors. in giving weight to different results obtained in similar experiments.

(3) This paper discusses the applicability of statistical methods and the theory of errors to the results of field experiments and the author shows that the standard deviation per plot over a period of three months, where the plot is the size of a tapper's task, is 5 per cent. This makes possible the detection of 10 per cent. differences with four duplications.

The records analysed in these three papers are of great value and mark a distinct advance in the "control" of field experiments with Hevea. The results of similar work in other experimental stations are awaited with interest.

G. E. C.

DEPARTMENTAL NOTE.

Mr. D. Coghill assumed duties as Assistant Agricultural Chemist, Department of Agriculture, Federated Malay States, on 4th September, 1918.

MINUTES OF A MEETING OF THE ADVISORY COMMITTEE, DEPARTMENT OF AGRICULTURE,

HELD AT THE OFFICES OF THE DEPARTMENT, ON WEDNESDAY, 20TH NOVEMBER, 1918, AT 11 A.M.

PRESENT:—Mr. L. Lewton-Brain (Director of Agriculture) Chairman, Messrs. C. Bell, W. de Leighton Brooke, T. W. Hodge, J. D. McCulloch, R. W. Munro, Chew Kam Chuan, Lee Kong Lam and Mr. B. Bunting (Assistant Agriculturist), Honorary Secretary.

ABSENT:—The Hon'ble Mr. R. C. M. Kindersley, Messrs. H. Armstrong, W. S. Cookson, J. S. Ferguson, L. A. Irving, A. B. Milne, R. H. Phillips and C. Ritchie.

Messrs. B. J. Eaton, G. E. Coombs and F. G. Spring attended the meeting.

The CHAIRMAN welcomed the two Chinese members, Messrs. Chew Kam Chuan and Lee Kong Lam, who had been appointed by Government to represent the Chinese planting interests on the Advisory Committee.

1.—MINUTES.

The minutes of the previous meeting held on 30th July, 1918, having been circulated, were taken as read and confirmed.

2.—QUARTERLY PROGRESS REPORTS.

The quarterly progress reports of officers of the Department, having previously been circulated, were laid on the table and the Chairman invited discussion.

Mr. BROOKE asked whether the pamphlet had been prepared and circulated showing the deleterious effect of commercial alum on raw rubber when used as a coagulant.

The CHAIRMAN replied that a paper had been prepared and translated into Malay. The circular was now being printed, and would shortly be circulated through the District Officers. The Chinese and Tamil translations had been asked for, but had not yet been received.

Mr. BROOKE suggested that if possible the printing of the pamphlet should be accelerated as the matter was one of very great importance.

3.—PLANTING CONDITIONS ON SMALL-HOLDINGS.

The CHAIRMAN reported that he had circulated the various District Officers regarding the conditions of planting rubber on small-holdings, and from the replies received it appeared that in some cases no land was being alienated for rubber at present, but the previous conditions of titles prescribed a minimum number of trees per acre and not a maximum.

Mr. HODGE considered that one of the conditions of any new title should be to fix a minimum and a maximum number of rubber trees per acre and, if possible, state that the small-holder should only be allowed to plant up areas which he was in a position to upkeep and maintain in good cultivation.

On the proposal of Mr. Hodge, seconded by Mr. Brooke, it was agreed to refer the matter to Government.

Mr. MCCULLOCH suggested that the Committee might also draw the attention of Government to the fact that section 11 (i) of "The Rubber Dealers' Enactment No. 5 of 1909," requiring that a licence must be taken out within a month of planting rubber, was not being observed by small-holders. This was agreed to.

4.—EXPERIMENTAL COCONUT PLANTATION.

The CHAIRMAN informed the meeting that he had circulated Mr. Lambourne's report on the working of Sipantas Estate. Mr. Munro's report had been received, but had not yet been circulated, so he would ask Mr. Munro to give the Committee a brief account of the work which had been done since he made his last quarterly report.

Mr. MUNRO stated that owing to difficulties in supervision in the early part of the year it would be impossible to carry out the programme previously arranged, but since Mr. Lambourne had been able to give his whole attention to the working of the estate very satisfactory progress had been made and it was now estimated that by the end of the year 739 acres would be either planted or cleared ready for planting.

The labour force, which at the commencement consisted of about 250 Tamil coolies, had now been increased to over 600, almost entirely by recruiting from India. When the present area was thoroughly cleaned up, allowing an average of one cooly for every five acres, it would be necessary to weed out the labour force.

The coconut trees were responding to the extra cultivation and it was estimated that 250 acres of the area planted in 1915 would be in bearing in another year's time.

The area under rubber, about 100 acres, was not showing very satisfactory growth, and digging and forking would have to be resorted to before any improvement could be expected.

The buildings were now in excellent condition and two sets of permanent cooly lines, containing 20 rooms each, had just been completed.

The CHAIRMAN pointed out that a monthly report form showing details of expenditure was being submitted each month by Mr. Lambourne, and until the estate was revenue producing he did not consider that a new report form was necessary.

A copy of the present report form was laid on the table for inspection.

Mr. MUNRO stated that the sub-committee for the coconut experimental plantation held a meeting and discussed the question of carrying out experiments on coconuts with the departmental committee for experiments, and a comprehensive scheme of experimental work had been drawn up.

It was suggested that details of the scheme should be circulated so that members would have a better opportunity of discussing it at the next meeting. This was unanimously agreed to.

5.—CO-OPERATIVE OIL MILLS.

The CHAIRMAN informed the meeting that a special sub-committee held a meeting on November 5th to discuss a scheme for the formation of a local company to erect co-operative oil mills for the expression of coconut oil in the Federated Malay States, and Mr. Eaton explained the present position.

Mr. MUNRO understood that a group of coconut estates had already written home with regard to a similar scheme.

Mr. MCCULLOCH suggested that every encouragement should be given to the proposed formation of a local company.

After some discussion it was proposed by Mr. McCulloch and seconded by Mr. Bell that the Committee approve of the recommendations of the special sub-committee for establishing coconut-oil mills.

This was unanimously agreed to.

Mr. EATON explained that in connection with enquiries regarding costs of oil expression plant, quotations had been received from the following firms :

Greenwood and Batley, Leeds.—Improved "Albion" Oil Mill Installation. One unit having a capacity of 2 tons of copra per hour, including boiler and engine. Total cost, about $300,000.

Rose, Downs and Thompson, Hull.—Two units having a total capacity of 2 tons of copra per hour, exclusive of boiler and engine. Total cost, about $200,000.

French Oil Mill Machinery Co., U.S.A.—One unit having a capacity of about 2 tons of copra per hour, inclusive of boiler, engine and storage tanks. Total cost, about $172,000.

The V. D. Anderson Co., Ohio.—Ten units having a total capacity of $2\frac{1}{2}$ tons of copra per hour, inclusive of motors. Total cost, about $80,000.

6.—NEW AGRICULTURAL INDUSTRIES.

The CHAIRMAN reported that in connection with the proposed large scale experimental farms the estimates of expenditure drawn up by the sub-committee for experiments had been approved by Government and that a vote of $50,000 had been included in the draft estimates for next year. Although a number of areas had been reserved in the different States he considered that if suitable land was available it would be advisable to start the first experimental farm in Selangor, and Mr. Spring was at present endeavouring to select a suitable area of State land at Kepong adjoining the Sungei Buloh Forest Reserve, but so far had not been able to make any definite recommendations on the matter.

Mr. SPRING informed the Committee that he visited an area situated at the 15th mile, Kuala Selangor Road, but was not satisfied that this land was suitable for an experimental farm, as the soil was of a sandy nature and the land likely to be swampy in places.

He also remarked that the area in question was probably too small for the purpose, but considered that suitable land might be obtained in that district.

It was suggested by Mr. Brooke that if suitable State land was not available the Chairman should write in to Government asking that an area be obtained in the Sungei Buloh Forest Reserve.

Mr. McCULLOCH pointed out that there were large areas of first class land in the Rompin and Bahau districts of Negri Sembilan, particularly on the new road from Johol to Gemas, and suggested that an area of at least 2,000 acres should be reserved in this locality for one of the large scale experimental farms.

7.—STOCK-BREEDING FARM.

The CHAIRMAN informed the Committee that detailed estimates for the establishment of a stock-breeding farm had since been submitted to Government, but so far had not been approved.

After some discussion it was proposed by Mr. Brooke and seconded by Mr. McCulloch that the following resolution be put to the meeting "that great disappointment is expressed by this Committee that no action has yet been taken by Government in connection with the proposals of the Advisory Committee regarding the stock-breeding farm and it would ask that provision be included in the 1919 Estimates."

This was put to the meeting and passed unanimously.

8.—RUBBER RESEARCH CONTROL.

The question of rubber research control was brought up for discussion and it was decided that the whole matter be left over until the next meeting.

The meeting terminated at 1 p.m.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

held at the Town Hall, Penang, on 25th November, 1918, at 10 a.m.

PRESENT:

The Honourable Mr. R. C. M. Kindersley (*in the Chair*)

and the following DELEGATES:

From	Batu Tiga D.P.A.	Mr. G. H. Bennett
„	Central Pahang P.A.	Messrs. P. J. A. Williams and G. N. Magill
„	Central Perak P.A.	Messrs. W. R. Shelton-Agar, E. L. D. Evans, P. E. Lawford and T. H. Murray
„	Johore P.A.	Mr. Chas. Prentice
„	Kajang D.P.A.	„ G. L. O'Hara Hickson
„	Kapar „	Messrs. L. Mooijaart and W. P. Okeden
„	Klang „	„ H. R. Quartley, R. Napier Hendrie and E. C. Wakefield
„	Kuala Lumpur D.P.A.	„ J. B. Douglas, F. Clyde Jeavons and Lt.-Col. A. J. Fox
„	Lower Perak P.A.	„ W. Dell, R. G. Bayley, W. R. C. Grey, R. H. Phillips and Dr. C. Giddy
„	Malay Pen. Agl. Assoc.	„ J. Cruickshank, A. A. Cruigen, T. Wilson, J. W. Kennedy, Wm. Duncan, A. R. Morgan, Geo. Stothard and W. Rankin
„	Negri Sembilan P.A.	„ R. Gooch, C. Ritchie, J. Davidson McCulloch and A. Waterfield
„	Taiping D.P.A.	„ C. F. Hewett, Geo. Low and W. H. Tate

VISITORS.—Messrs. H. R. Owen, R. H. Wardlaw, J. Dick, F. R. Long and William Jack.

SECRETARY.—Mr. H. C. E. Zacharias.

1.—WAR.

Mr. KINDERSLEY says that before they entered on the current business of the meeting, he wishes to propose "that this Association records its deep sense of gratitude and thanks to the Imperial Forces of the country and of those of our Allies, on the occasion of the victorious termination of hostilities."

In doing so, they remembered and honoured especially those of their number who left Malaya to offer their services and who had given their lives for their country and for the freedom of humanity throughout the world. He hopes that eventually a memorial would be raised in Malaya, worthy of the heroes for whom they mourned and worthy of this country. (Applause.)

The resolution is carried unanimously, by acclamation.

Mr. KINDERSLEY, continuing, feels, now that Peace might be said to be in sight that it became their duty to consider the extremely important question of whether Germans were to be allowed again to settle in their midst.

He mentioned Germans, alone, because bad as their allies, the Austrians, Bulgarians and the Turks, had proved themselves to be under their German leaders, they did not look on them, as they did on the Germans, as unclean beasts.

It would be an insult to their glorious dead if they were to welcome back those traitors whose hands were now stained with the blood of our murdered countrymen and of their women and children.

Let there be no mistake, the people of Germany were no better than their leaders. They cheered their leaders at the outbreak of war, the war was popular, they cheered their leaders when the "Lusitania" was sunk, when Nurse Cavell and Captain Fryatt were murdered and they would cheer them now and serve their towns and women and children as they did those of Belgium and Northern France if they were victorious. It was to be hoped that no weakness on the part of the Allied Governments would let the Germans escape the punishment that they had earned and that until they had been made to repent that they would be debarred from entering any of the allied countries.

Had they fought clean and lost they could have shaken them by the hand as gallant foes but they did not fight clean and are murderers and worse than murderers.

He, therefore, hopes that some member will propose a resolution requesting the Governor of this country to convey their earnest desire to the Home Government that no German may be permitted to enter into business or obtain employment in Malaya for a period of years and thereafter only under licence from the Government. (Applause.)

Mr. WAKEFIELD begs to move that "This meeting of the Planters' Association of Malaya expresses its earnest desire to His Excellency the Governor of the Straits Settlements and High Commissioner of the Federated Malay States, that no person of German nationality be permitted to engage in trade or to obtain employment in British Malaya for a period of years after the declaration of peace and even then only under licence granted by the Government."

Col. Fox seconds the proposal, which is carried unanimously.

2.—MINUTES.

The minutes of the meeting held on 28th August having been taken as read,

Mr. KINDERSLEY points out on page 12 a printers' error which made it look, as if he were speaking, whilst the passage was merely a reference to himself by Mr. Kennedy.

Mr. GOOCH calls attention on page 16 to remarks which had been made by himself and not by Mr. Okeden.

Subject to the rectification of these two points the minutes are, on the motion of Mr. Wakefield, seconded by Mr. Jeavons, confirmed and signed.

3.—WAR RELIEF.

The SECRETARY reports that to date he had received $3,043.24 on behalf of a "Malcolm Cumming" Memorial Church Army Hut; and submits the following correspondence and accounts:

"*3rd September, 1918.*

"SIR,

"I have the honour to ask your approval, in the terms of 'The War Funds Enactment, 1918,' of the Planters' War Relief Fund of Malaya being continued.

"I have, etc.,

"(Sd.) H. C. E. ZACHARIAS,

"*Secretary.*

"THE HON'BLE

"THE CHIEF SECRETARY,

"FEDERATED MALAY STATES,

"KUALA LUMPUR."

"KUALA LUMPUR,

"FEDERATED MALAY STATES,

"*5th September, 1918.*

"No. 4099/18.

"SIR,

"I am directed to acknowledge receipt of your letter dated the 3rd September, 1918, and to inform you that the Chief Secretary to Government authorizes, under the provisions of Enactment No. 31 of 1918, the continuance of the Planters' War Relief Fund of Malaya.

"I have, etc.,

"(Sd.) M. S. H. MCARTHUR,

"*Under Secretary to Government, F.M.S.*

"THE SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

Receipts.	Amount. £	s.	d.
Balance from last account	27,797	10	7
Remittances from the Planters' Association of Malaya	2,038	15	9
Donations—E.T.C. Garland, £100; the Telok Piah Rubber Estates (1914), Ltd., £26 5s.	126	5	0
Refund of Income-tax deducted from Interest on Securities held by the Bank	188	2	4
Interest on Securities	354	0	9
Interest on Balance of Current Account	7	4	0
	30,511	18	5

Payments.	£	s.	d.	Amount. £	s.	d.
Grants and gratuities:						
Mrs. ——	25	0	0			
„ ——	25	0	0			
„ ——	20	0	0			
„ ——	15	0	0			
Mr. ——	50	0	0			
„ ——	25	0	0			
Mrs. ——	50	0	0			
Mr. ——	50	0	0			
„ ——	25	0	0			
Mrs. ——	25	0	0			
Mr. ——	25	0	0			
Mrs. ——	9	0	0			
„ ——	4	0	0			
Mr. ——	15	0	0			
				363	0	0
S.S. Funds. Payments to Y.M.C.A. for board of				13	17	0
„ Mr.—Expenses				12	10	0
„ „ — „				8	16	0
Receipt book and rubber stamps				0	3	3
Bank charges—cheque book				0	4	2
Balance in hand				30,113	8	0
				30,511	18	5

The Balance £30,113 8s. is disposed of as under:	£	s.	d.
Five per cent. War Loan (£12,000) at cost	11,400	0	0
Six per cent. Exchequer Bonds	2,000	0	0
Five per cent. National War Bonds	15,000	0	0
Deposit in Chartered Bank of India, Australia and China	1,000	0	0
	£ s. d.		
Balance of Current a/c in Chartered Bank 721 11 3	713	11	3
Less outstanding cheques 8 0 0			
	30,113	11	3
Due to Treasurer	0	3	3
	30,113	8	0

(Sd.) W. T. Taylor,
15th July, 1918.

I certify that I have audited the above statement of receipts and payments with the books and vouchers of the Fund and find the same to be correct. The grants have all been duly authorized by the Committee.

(Sd.) A. H. Cullen,
Chartered Accountant,
Honorary Auditor.

73, Basinghall Street, E.C.,
18th July, 1918.

PLANTERS' WAR RELIEF FUND OF MALAYA.

Subscriptions received up to 23rd November, 1918.

	$ c.	$ c.
BATANG PADANG.	790.00	
Davidson, R. ...	30.00	
		820.00
BATU TIGA.		
Balloch, R. B. ...	35.00	
Bell, C.	175.00	
Bennett, G. H. ...	175.00	
Bragg, W. H. ...	140.00	
Chalmers, A. P. ...	105.00	
Crush, C. N. ...	70.00	
Cumming, T. J. ...	175.00	
Davidson, A. ...	70.00	
Davidson, D. C. K....	160.00	
Finkleston, G. ...	15.00	
Gilman, M. A. P. ...	70.00	
Johns, E. D.... ...	60.00	
Glenmarie Staff ...	140.00	
McNeill, F.	70.00	
Nixon, R.	50.00	
Ord, J. G.	40.00	
Orr, H. Douglas ...	105.00	
O'Malley, F. B. ...	70.00	
Robertson, J. A. ...	70.00	
Sansom, P. N. ...	45.00	
Spooner, A. F. ...	60.00	
Tucker, W. S. Reeve	70.00	
Webb, C. M. ...	35.00	
Will, R. W.	56.00	
Williamson, J. ...	70.00	
		2,131.00
CENTRAL PAHANG.		
Birkemose, F. ...	100.00	
McVitie, D. D. ...	75.00	
Sungei Bilut Estate	70.00	
Williams, P. J. A. ...	170.10	
Willis, E. J. ...	105.00	
		520.10
CENTRAL PERAK.	1,796.00	
Caldwell, W. J. ...	120.00	
Jonklaas, W. O. ...	140.00	
Robins, N.	35.00	
Wilson, T. K. ...	105.00	
		2,196.00
JOHORE, P.A.		
Adamson, H. ...	40.00	
Anker, E.	30.00	
Batu Anam Club ...	484.00	
Carried forward ...		5,667.10

	$ c.	$ c.
Brought forward		5,667.10
JOHORE, P.A. —(*cont.*)		
Becker, F. E. ...	30.00	
Bell, C. E.	40.00	
Bolton, G. V. ...	252.00	
Bradbery, C. ...	100.00	
Bradburne, C. W. ...	100.00	
Cox, C. N.	50.00	
Cummins, H. ...	30.25	
Creighton, R. G. ...	60.00	
Dawson, G.	10.00	
Gawler, W. N. ...	50.00	
Gilfillan, W.... ...	12.00	
Gomali Club... ...	108.00	
Innes, A.	10.00	
Jessen, G.	87.00	
Kluang Estate ...	120.00	
Lanadron Staff ...	100.00	
Le Doux, J. S. ...	25.00	
Mengkibol Estate ...	25.00	
Mersing Estate Staff	35.00	
Monson, J. H. ...	50.00	
Muar River Estate Staff	229.00	
Nordanal River Estate Staff	250.00	
Permas River Estate Staff	120.00	
Ramsay, H. H. ...	30.00	
Robertson, A. W. ...	50.00	
Ross, D. A.	239.95	
Segamat Estate Staff	140.00	
Smith, St. Alban ...	50.00	
Spencer, E. S. ...	100.00	
Sungei Dangar ...	52.00	
Tebrau Estate Staff	458.50	
Tinker, A.	50.00	
		3,617.70
KAJANG, D.P.A.	330.00	
Beaty, C.	70.00	
Biggin, B.	60.00	
Clerk, G. P.	140.00	
Cummins, E. N. T. ...	175.00	
Dakeyne, O. P. ...	175.00	
Ferrers, C. R. ...	140.00	
Fowler, H. O. ...	98.50	
Carried forward ...		9,284.80

	$ c.	$ c.
Brought forward		9,284.80
KAJANG, D.P.A. —(*cont.*)		
Hickson, G. L. O'Hara	140.00	
Kinder, C.	70.00	
Kindersley, the Hon'ble R. C. M.	175.00	
Mactaggart, R. K. ...	49.00	
Mesney, R. F. ...	105.00	
Miller, C. H. ...	10.00	
Moullin, H. R. ...	175.00	
Paul, C.	20.00	
Pinhorn, P. R. ...	30.00	
Schwabe, E. M. ...	140.00	
Solbe, H. E. G. ...	350.00	
Sparshott, H. C. ...	30.00	
Tyler, E. W.	60.00	
Wiggins, T. G. ...	10.00	
		2,552.50
KAPAR, D.P.A.		
Armstrong, F. E. J.	40.00	
Fisher, N.	210.00	
Gray, F. E. A. ...	70.00	
Mooijaart, L. ...	140.00	
O'Brien, W. L. R. ...	175.00	
Pratt, J. C.	63.00	
Stonehewer, E. S. ...	119.00	
Tedlie, T. H. ...	70.00	
		887.00
KELANTAN, P.A.		
Anderson, W. G. ...	175.00	
Archer, L. D. ...	105.00	
Taylor, A. N. ...	70.00	
		350.00
KLANG, D.P.A.	380.00	
Ayer Hitam Planting Syndicate	1,000.00	
Battiscombe, R. B. ...	70.00	
Biddlecombe, H. T. A.	84.00	
Buxton, C. A. ...	140.00	
Greenhill, R. D. ...	175.00	
Gulland, D. L. ...	70.00	
Hardingham, H. P. ...	125.00	
Hendrie, R. Napier ...	120.00	
Latimer, T. M. ...	60.00	
Maguire, C.	70.00	
Midlands Estate ...	56.00	
Prior, E. B.	105.00	
Quartley, H. R. ...	525.00	
Roberts, C. L. ...	70.00	
Carried forward ...		13,074.30

	$ c.	$ c.
Brought forward		13,074.30
KLANG, D.P.A. —(*cont.*)		
Smith, C. Hammond	175.00	
Trollope, F. A. ...	75.00	
Wakefield, E. C. ...	120.00	
		3,420.00
KUALA LANGAT.	675.19	
Irvine, H. C. d'Arcy ...	105.00	
Lendrum, J. B. ...	105.00	
Mann, J. P.	70.00	
Munro, R. W. ...	140.00	
Symons, G. O. W. ...	40.00	
		1,135.19
KUALA LUMPUR.	278.84	
Armstrong, H. ...	175.00	
Barnet, G. P. ...	175.00	
Campbell, F. M. ...	175.00	
Coppens, P.	80.00	
Douglas, J. B. ...	133.20	
Farrell, M.	60.00	
Fox, Lt.-Col. A. J. ...	60.00	
Fraser, W. D. ...	160.00	
Gardner, D. S. ...	205.00	
Harvey, F. G. ...	140.00	
Harvey, T. R. ...	70.00	
Jeavons, F. C. ...	100.00	
Laddell, R. G. ...	140.00	
Luschwitz, T. H. ...	40.00	
Neilson, James ...	44.00	
McCrow, D. W. ...	70.00	
Quaife, Dr. W. T. ...	25.00	
Smith, M. Sharpe ...	179.97	
Wilkinson, H. B. ...	140.00	
Zacharias, H. C. E. ...	105.00	
		2,556.01
KUALA SELANGOR, D.P.A.		
Brown, T. L. ...	70.00	
Estrange, G. R. L. ...	80.00	
Fesq, E. W.	175.00	
Gordon, W. M. ...	119.00	
Irving, L. A. ...	210.00	
Laporte, E. W. ...	10.00	
More, Thomas ...	175.00	
Ransom, R. H. ...	25.00	
Quinton, L. M. ...	30.00	
Stevens, T. L. ...	140.00	
E. D. M. K. K. ...	280.00	
		1,314.00
Carried forward ...		21,499.50

	$ c.	$ c.
Brought forward		21,499.50
LOWER PERAK. P.A.		
Bayley, H.	105.00	
Bayley, R. G. ...	196.00	
Brodie, T.	120.00	
Bryant, G. W. ...	218.05	
Carmichael, D. ...	60.00	
Cruickshank, E. J. ...	10.00	
Dell, W.	60.00	
Dodgson, R. H. ...	70.00	
Dukes, M. B.	40.00	
Evans, R. C.... ...	70.00	
Hartley, M. R. ...	30.00	
McLeod, R. A. ...	120.00	
Park, H. H.	39.00	
Phillips, R. H. ...	80.00	
Pickering, J. T. ...	15.00	
Pratt, F. T. B. ...	10.00	
Ratanui Estate Staff	162.30	
Sabrang „ „	271.00	
Selaba „ „	110.00	
Symes, A. B. ...	120.00	
Tobutt, K.	70.00	
Wilson, R. J. ...	15.00	
		1,991.35
M. P. A. A.		
Alor Pongsu and Brieh Estates ...	65.00	
Baber, E.	105.00	
Bukit Mertajam Estate	319.00	
Carless, H. G. ...	84.00	
Chersonese Estate ...	441.32	
Darke, A. E. G. ...	140.00	
Gula Kalumpang Rubber Estates ...	728.00	
Hargreaves, J. ...	70.00	
Josselyn, E. W. ...	140.00	
Mackay, C. H. ...	54.00	
Mallett, N. W. ...	80.00	
Rasmussen, H. G. ...	80.00	
Rickeard, H. W. ...	140.00	
Sherwood, B. ...	144.00	
		2,590.32
NEGRI SEMBILAN.	750.00	
Adair, H.	105.00	
Adames, T. Slade ...	40.00	
Burgess, I.	148.00	
Clarkson, S. W. ...	70.00	
Crawford, W. P. ...	45.00	
Carried forward ...		26,081.17

	$ c.	$ c.
Brought forward		26,081.17
NEGRI SEMBILAN —(*cont.*)		
Cuthbertson, T. F. ...	40.00	
Fenton, R. D. ...	140.00	
Foster, M. K. ...	20.00	
Grant, G.	140.00	
Handover, W. P. ...	70.00	
Hanmer, H. R. ...	98.00	
Hay, J. B.	59.50	
Hearn, A. J. ...	70.00	
Heherr, F. J. ...	105.00	
Hingston, G. W. ...	100.00	
King, H. W. F. ...	105.00	
Mansfield, L. ...	28.00	
Maycock, R. M. A. ...	70.00	
Mills, E. G.	700.00	
Mills, G. R.	12.00	
Paterson, A. F. ...	120.00	
Ritchie, C.	105.00	
Reynolds, K. P. ...	140.00	
Sepang Valley Estate	500.00	
Smith, E. E. ...	140.00	
Swinton, C. H. ...	140.00	
Tayler, V. A. ...	350.00	
Watt, Wm.	70.00	
A Pound of Flesh ...	10.00	
		4,490.50
TAIPING, D.P.A.	508.50	
Bruas Estate ...	110.00	
Croal, T. Gordon ...	110.00	
Grant, G. A.... ...	140.00	
Jameson, A. C. ...	40.00	
Moraes, H. F. ...	70.00	
Perera, C.	35.00	
Ritchie, C.	75.00	
Tate & Co.	150.00	
Willis, A.	70.00	
		1,308.50
ULU SELANGOR, D.P.A.	538.25	
Brunton, R.	80.00	
Coe, P. F.	70.00	
Dakeyne, N. H. ...	105.00	
Fallon, M. D. ...	140.00	
Fleming, D. J. ...	56.00	
Hastings, P. E. ...	30.00	
Kennaway, M. J. ...	175.00	
Kennedy, W. C. ...	71.75	
		1,266.00
R. W. Fox-Male		50.00
Grand Total ...		33,196.17

Mr. Kindersley thinks that the Fund would probably now soon have to be closed, in the meantime, however, he hopes that there would be no slackening of efforts, as the calls on the Fund were very large.

Mr. Ritchie suggests that it would be advisable to ascertain from those administering the Fund what total sum was required. Now that hostilities had ceased this should be quite feasible and it would give them an idea of what to aim at.

The Secretary is instructed to address Sir William Taylor accordingly.

4.—QUARANTINE.

The Secretary submits the following correspondence:

"Kuala Lumpur,
"*30th August, 1918.*

"Sir,

"I have the honour to acknowledge receipt of your letter 4328 of July 16th.

"I am instructed to enquire who appoints the visitors in question and who informs them of their appointment.

"I have, etc.,
"(Sd.) H. C. E. Zacharias,
"*Secretary.*

"Under Secretary,
"Federated Malay States,
"Kuala Lumpur."

"Kuala Lumpur,
"Federated Malay States,
"*5th September, 1918.*

"No. 4328/16.

"Sir,

"I am directed to acknowledge the receipt of your letter inquiring who appoints visitors to the Quarantine Camp at Port Swettenham and who informs them of their appointment.

"2. There is no statutory provision regarding the appointment or notification of such visitors.

"The Chief Secretary in April, 1917, approved the appointment, as visitors, of the gentlemen mentioned in my letter of the 16th July last. It would appear ordinarily to be a matter of indifference who should inform visitors of their appointment, provided that they are duly informed. In this case, unfortunately, there was a misunderstanding, as a result of which these gentlemen did not receive formal notification of their appointment until July last. Letters were sent from this office as soon as it was discovered that there had been this misunderstanding.

"I have, etc.,
"(Sd.) M. S. H. McArthur,
"*Under Secretary to Government, F.M.S.*

"The Secretary,
"Planters' Association of Malaya,
"Kuala Lumpur."

"KUALA LUMPUR,
"*11th September, 1918.*

"SIR,

"I have the honour to acknowledge receipt of your letter 4328 of the 5th instant.

"As this Association is desirous of arranging with the planters appointed, to make regular visits to the camp, I should be glad if you would kindly supply me with a list of visitors who have accepted the appointment.

"I have, etc.,

"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"FEDERATED MALAY STATES,
"*21st September, 1918.*

"No. 4328/16.

"SIR,

"With reference to your letter of the 11th September, 1918, I am directed to forward herewith a list of gentlemen who have accepted appointment as visitors to the Quarantine Camp at Port Swettenham.

"2. The list is being published in the *Gazette*.

The Controller of Labour, Federated Malay States.
The District Officer, Klang.
The Chairman, Klang District Planters' Association.
" " Kapar " " "
" " K. Langat " "
" " K. Selangor " "
Dr. W. A. Young, M.O. Highland and Lowlands Para Rubber Co., Klang.
Mr. R. W. Munro, Manager, Gedong Estate Syndicate, Ltd., Banting, Selangor.
" H. R. Quartley, Whittall & Co., Klang.
" N. Fisher, Manager, Harpenden Rubber Co., Ltd., Klang.
" E. B. Prior, Golden Hope Estate, Klang.
" R. K. Walker, Klang.
" J. Hunter, Jeram, Kuala Selangor.
" G. H. Bennett, Klang.
" R. N. Hendrie, Klang.

"I have, etc.,

"(Sd.) A. CALDECOTT,
"*for Under Secretary to Government, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. KENNEDY wonders why, if it was desirable to have a roster of visitors for the Port Swettenham Station, it was not equally desirable to have one for Penang, where he believes nothing so far had been done in this direction.

Mr. DUNCAN replies that although no visitors had officially been appointed, the Quarantine Camp at Penang was frequently visited.

Mr. KENNEDY proposes that Government be requested to appoint a number of visitors to the Penang Quarantine Station, in the same manner as was now done at Port Swettenham.

Mr. LAWFORD seconds the proposal, which is carried unanimously.

Mr. PHILLIPS introduces Dr. Giddy, whom he asks kindly to inform the meeting of the facts in respect of the recent cholera outbreak in Lower Perak.

Dr. GIDDY says he wished to bring the following facts to their notice regarding the recent outbreak of cholera in Telok Anson, Lower Perak. On 21st August, 1918, 14 coolies shipped from India by s.s. "Fultala" arrived on Sabrang Estate. On 25th August, a further batch arrived, which had travelled in the s.s. "Euryalus."

Nine days after the "Fultala" coolies, and four days after the "Euryalus" coolies arrived, cholera broke out on the estate.

The first case to occur was in the lines, where 13 out of the 14 "Fultala" batch had been housed in a room, which two or more of the "Euryalus" batch had shared with an old estate cooly. Twelve days after cholera had broken out—*i.e.*, on 11th September, 13 coolies in the "Fazilka" arrived from the Penang Quarantine Station, and by a grave mistake were allowed on Sabrang. As the estate was infected with cholera and in quarantine this batch was segregated and all precautions taken that they should not, in all due fairness to them, come in contact with the other estate coolies.

They were housed in the old office, which was an excellent building with a cement ground site, and it had not been used for some months.

Food and drink were taken to them and a guard put on to prevent entrance and exit. Ten days later cholera broke out in this segregated batch. Although the first case of cholera to occur on Sabrang Estate was on 13th August, the 4th Mile Division of Nova Scotia Estate, which has a river frontage, like and close to Sabrang, was quite free of cholera for 16 days after the onset of the Sabrang outbreak, although there was a strong possibility of the infection being carried by the river to this division. On the seventeenth day, however, 15th September, cholera did break out on this division, four days after the "Fazilka" coolies had been housed there. It should be noted that cholera, as already mentioned, also broke out in the Sabrang segregated "Fazilka" batch.

Eleven days after the outbreak of cholera at Sabrang, the Health Officer at Telok Anson wrote to the Penang Quarantine Station authorities inquiring as to whether any ships which had recently brought over coolies from India had been infected with cholera. The reply was to the effect that both the s.s. "Fultala" and "Fazilka" had had cholera on board. As mentioned above

the s.s. "Fultala" brought coolies for Sabrang Estate and the s.s. "Fazilka" brought coolies for both Sabrang Estate and the 4th Division of Nova Scotia.

The above facts pointed very strongly to the suspicion that cholera was imported into that district by those new coolies and it is much to be regretted that no notification of these infected ships was sent either to the Health Officer there or to the managers of the estates to where these coolies were despatched. Had this been done (the suspected importation of cholera from the Penang Quarantine Station being taken as confirmed) the outbreak on both Sabrang and Nova Scotia could have been dealt with quickly and efficiently and with a fraction of the expense it had incurred to these estates, to say nothing of the subsequent infection of Telok Anson and various river kampongs.

It would also be reasonable to infer that the precautions taken at the Penang Quarantine Station as regards cholera are inadequate. He understands that 7 to 10 days' quarantine were given to these coolies, which he thought in most medical men's opinion was too little. It was universally recognized by Medical Authorities that a cured case of cholera, or even a person who had been in contact with cholera but had not necessarily shown any signs or symptoms of the disease, was capable of spreading it for as long as 50 days. These cases were termed "carriers." This point of "carriers" was apparently waived by the Penang Quarantine Station Authorities as being of no importance. The services of a Bacteriologist would obviously be necessary to cope with the "carrier" question but non-importation of cholera could almost be guaranteed.

Mr. Gray thinks the most serious point was the omission on the part of the Government to notify the estate doctors that cholera-infected ships had arrived in Penang. Only after exhausting every possibility of local infection had Dr. Giddy and the Government Health Officer at Telok Anson been forced to the conclusion that these cases of cholera had been contracted in the Penang Quarantine Station. Another point on which he had grave misgivings was the question as to whether a 10 days' quarantine was sufficient. Some advocated a period of 20 days. The problem was principally that of the so-called "carriers" and that could only be coped with by the employment of a Bacteriologist. With the end of war in sight, it should not be difficult to obtain the services of such. Finally, he would advocate the absolute necessity of paying more attention to the disinfection of all coolies' belongings. He hopes sincerely that the Planters' Association of Malaya would assist them on all these points.

Mr. Phillips proposes that the Secretary enquire of Government into the non-notification to those concerned of the cholera-infected ships and request that a thorough enquiry be held on the matter to ensure a more efficient safeguard against the introduction of cholera.

Mr. Kennedy thinks India was a good deal to blame in this matter. He understands that the recent outbreak of cholera at the Avadi Camp, *e.g.*, had been quite preventible, if only cholera patients had not been permitted to mingle freely with all others in the cooly camp. He thinks the Indian Immigration Committee should be asked to look into the matter.

Mr. Bailey seconds Mr. Phillips' proposal, which is carried; and the Secretary is also instructed to send a copy of his letter to the Indian Immigration Committee.

Mr. Lawford draws attention to the frequent cases of absconding from the Penang Camp.

Mr. Okeden bears out the complaint and says that absconding really took place before the coolies reached the camp.

Mr. Murray says he had written to the Indian Immigration Committee on this point, but had received no reply so far.

The Secretary is instructed to add this question in his letter to the Indian Immigration Committee.

5.—LABOUR.

The Secretary reports having circularized all Constituent Associations *re* present practice of issuing kangany licences in Penang only and tables replies received *re* hardships thereby incurred.

He also submits the following correspondence:

"Kuala Lumpur,
"*11th September, 1918.*

"Sir,

"I have the honour to inform you that at a meeting of the Standing Committee of this Association held to-day I was instructed to ask your Committee to consider the advisability of the issue of kangany licences by all Assistant Controllers of Labour instead of at Penang only as is the present practice.

"I have, etc.,
"(Sd.) H. C. E. Zacharias,
"*Secretary.*

"Chairman,
"Indian Immigration Committee,
"Kuala Lumpur."

"Labour Office, Penang,
"*25th November, 1918.*

"No. 4 in I. I. C. Misc. 578/18.

"Sir,

"With reference to your letter of 11th September last, addressed to the Chairman, Indian Immigration Committee, asking this Committee to consider the advisability of the issue of kangany licences by all Assistant Controllers of Labour instead of at Penang only, I have the honour to inform you that the question was considered by the Indian Immigration Committee at their last meeting and it was decided that it was not practicable to make any change in the existing system.

"2. I was instructed as Secretary to prepare a memorandum explaining the position and this I now enclose for your information.

"I have, etc.,

"(Sd.) E. W. F. GILMAN,

"*Secretary, Indian Immigration Committee.*

"THE SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

"MEMORANDUM.

"Kangany licences have since the inauguration of the licensing system been registered in Penang only and in view of the practical necessity of maintaining a single register of licences it is difficult to see how any other arrangement would work.

"Prior to May, 1917, a very large proportion of licences were sent by post and if everything appeared in order they were registered and returned by post to the employer.

"With the introduction of the Indian Passport Regulations it became impossible to continue this procedure and the attached notice was issued by the Chairman of the Indian Immigration Committee on 16th May, 1917.

"While employers were asked to co-operate with the department in seeing that licences were issued to *bona fide* labourers only, it was obviously necessary to insist that all applicants should appear personally at the Penang Office to satisfy the Deputy Controller of Labour, as 'competent authority' under the Passport Regulations, that they were *bona fide* labourers, as he was responsible for seeing that the regulations were carried out. The registration of licences in Penang under the existing system naturally takes more time than formerly and it therefore happens, but only very occasionally, when the numbers are large that it is found impossible to complete the registration of all licences of kanganies who have embarked at Port Swettenham expecting to get their licences registered at Penang *en route* to India. In such cases the kanganies are told to proceed without their licences and that these will be forwarded by the following steamer to the Government Emigration Agent at Madras or Negapatam as the case may be and this is always done.

"As however misunderstandings have arisen at times in connection with licences detained in this manner it is as well that employers should impress on their kanganies that if they are required to leave Penang without their licences they should immediately on arrival in India call at the office of the Emigration Agent who will instruct them when to call again for licence.

"(Sd.) E. W. F. GILMAN,

"*Deputy Controller of Labour, Penang.*"

"C. of L. 238/17.

"NOTICE TO EMPLOYERS OF INDIAN LABOUR.

PASSPORTS.

"The attention of employers of Indian labour is drawn to the fact that under the Passport Rules, issued by the Government of India, no person coming from, or intending to proceed to, any place out of India shall, save as otherwise provided in the rules, land or embark at any port in British India without a passport. An exception is made in the case of *bona fide* labourers proceeding to or returning from the Malay States.

KANGANY LICENCES.

"2. Kanganies proceeding to India with licences to recruit, issued by the Indian Immigration Committee, are allowed to land without passports only in virtue of their being *bona fide* labourers. It will, therefore, be necessary in future to ensure that none but *bona fide* labourers receive licences.

"3. Employers are requested to co-operate with the Indian Immigration Committee in the matter by taking special care to avoid preparing licences for such persons as clerks, conductors, dressers, shop-keepers or any persons other than actual labourers.

"4. The certificate on page 4 of the new licence form requires a definite statement that the person described has been actually employed in some stated occupation for a definite period. For the future licences may not be given to any person whose occupation cannot be properly described as 'labourer.'

"5. Hitherto presentation of the licence by the kangany at the Penang Labour Office has not always been insisted upon; in order to keep a proper check over the issue of licences *it now becomes necessary to require every licence to be presented for registration at the Penang Labour Office by the kangany in person.*

"(Sd.) J. R. O. ALDWORTH,
"*Chairman,*
"*Indian Immigration Committee, F.M.S.*

"KUALA LUMPUR,
"*16th May, 1917.*"

"LABOUR OFFICE, PENANG,
"*4th October, 1918.*

"No. 2 in I. I. O. Misc. 605/18.

"SIR,

"I have the honour to inform you the s.s. 'Fazilka' arrived at Negapatam on 20th September, several cases of cholera having developed since the vessel left Madras.

"2. The Port Health Officer at Negapatam ordered the vessel to return to Madras where the coolies disembarked and proceeded to the depôt at Avadi.

"3. After disinfection the steamer returned to Negapatam on 23rd September where the coolies from Negapatam embarked.

"4. No coolies were brought from Madras.

"I have, etc.,
"(Sd.) E. W. F. GILMAN,
"*Deputy Controller of Labour, Penang.*

"THE SECRETARY.
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*11th September, 1918.*

"SIR,

"The present conditions prevailing on the B. I. ships plying between India and Penang have been considered by my Standing Committee who, *inter alia*, have had before them a letter addressed by Mr. C. F. Andrews to Mr. Mooijaart, extract from which I beg to append. (*Not printed.*)

"I have now been instructed by the Standing Committee to ask you kindly to call a Special Meeting of your Committee to deal with this matter.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"CHAIRMAN,
"INDIAN IMMIGRATION COMMITTEE,
"KUALA LUMPUR."

"OFFICE OF THE CONTROLLER OF LABOUR,
"FEDERATED MALAY STATES,
"KUALA LUMPUR,
"*25th September, 1918.*

"SIR,

"In reply to your letter dated 11th September current, receipt of which was formally acknowledged on the 12th instant, I have the honour to inform you that the Chief Secretary, to whom I submitted your letter and enclosure, is referring the papers to the Government of the Straits Settlements who entered into the contract with the British India Steam Navigation Company.

"It does not appear that any good purpose would be served by a discussion of the subject by the Indian Immigration Committee who are not parties to the contract with the B. I.

"I have, etc.,
"(Sd) J. R. O. ALDWORTH,
"*Controller of Labour, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. RITCHIE is afraid that Mr. Gilman's letter and memorandum did not convince him that the matter should not be reconsidered. The idea that a single register was essential, was one which he could not subscribe to. There were many devices such as manifold books, etc., which by no means made it imperative to have only one register. Not only the convenience of planters but the efficiency of the department would be served if the man on the spot (clearly the fittest person to do so) were to issue these licences. Another point was that all kanganies were *not* personally interviewed by the Deputy Controller of Labour. He had a case where a man had been told at sea, two days after the ship had left Penang, that his licence had been refused! The feeling was very strong in Negri Sembilan and they all must realize that the future of the labour position was an anxious one and that recruiting would have to be greatly facilitated in future.

Mr. HICKSON endorses the points raised by Mr. Ritchie.

Mr. BENNETT asks why, if the Passport Regulations admitted the possibility of licences being posted to India, after the cooly had left the country, it should not be permissible to post these licences to the estate, before he had left?

Col. FOX says there was often a delay of as much as a month before the kangany got his licence in India, and the practice led to much corruption.

Mr. HARVEY regrets that there seemed still to be a good deal of misunderstanding. The trouble was entirely due to the Passport Regulations of the Indian Government, who *as a concession* had allowed kangany licences to take the place of passports. They had probably no objection to the Indian Immigration Committee going back to the old practice, but in that case kanganies would require passports as well, which would mean greater, not fewer difficulties. All responsible people were agreed that the Indian Passport Regulations would never be done away with again and it was therefore, not a question to be looked at merely as a war measure. Under the present regulations the Deputy Controller *was* the only responsible officer, but of course the Indian Government might perhaps be induced to appoint all the five Assistant Controllers Passport Officers. But even so, the necessity for a single register remained and was a real difficulty, despite all that Mr. Ritchie had said.

He would take the opportunity of adding that nobody was more fully alive to the danger of a dwindling immigration from India, than the Indian Immigration Committee. Probably, however, matters would mend pretty speedily, once better shipping accommodation was available.

As regards the absconding at Penang, rather frequent at present, as also from the camps themselves, at present persons of the shop-keeper, etc., classes had great difficulty in emigrating and as a result, lots of them were smuggled over as agricultural labourers and the only remedy was greater care on the part of the kanganies.

Mr. RITCHIE thinks Mr. Harvey's remarks only bore out his contention that they should press for the consent of the Indian Government to an alleviation of the present system. He proposes that the whole matter be referred back to the Standing Committee.

Mr. BENNETT repeats that the outstanding fact was that the Deputy Controller even now did *not* personally register every kangany.

Mr. MCCULLOCH enquires whether the man who had been refused a licence and was told so two days out at sea, had obtained a passport?

Mr. HARVEY suggests that this man on arrival in India was probably not allowed to land.

Col. FOX says that coolies of his had been in India for weeks without licence or passport and many in fact had returned to the estate, having failed to obtain a licence.

Mr. GOOCH instances the similar case of one of his men who had been in India for a month and was now back on the estate.

Mr. KINDERSLEY points out that the success of some persons in evading the regulation was really no argument.

Mr. QUARTLEY questions how paid off coolies returning to India obtained permission to leave here and land in India? They had no licences and he felt quite sure no passports either.

Mr. DUNCAN would like to endorse the explanations given by Mr. Harvey. The Indian Immigration Committee were not obstructionists but most anxious to further recruiting. Apart from the lack of suitable shipping, the stoppage of emigration in respect of men between 18 and 25 years had greatly militated against successful recruiting at the present time.

Mr. HICKSON thinks the real point they should urge was that the approval of Assistant Controllers of Labour should ensure that a man arriving in Penang would get his licence as a matter of course.

Mr. JEAVONS seconds Mr. Ritchie's proposal to refer the matter to the Standing Committee.

Mr. KINDERSLEY feels sure that the Immigration Authorities would be only too pleased to consider any scheme that might be formulated with due regard to all the difficulties in the way.

Mr. HARVEY thinks Mr. Hickson's suggestion an excellent one, as it would greatly facilitate and expedite work in the Penang Office.

Mr. JEAVONS agrees but hopes that in that case the licence would be returned by post to the estate.

Mr. RITCHIE concurs, as their whole point was the desirability of knowing, before a cooly left the estate, whether or not he would get a licence. If no licence was issued after the cooly had left the estate, he was usually lost to that estate altogether.

Mr. RITCHIE and Mr. JEAVONS having withdrawn their proposal,

Mr. HICKSON proposes that applications for recruiting licences be made to the Assistant Controllers of Labour and, if approved and endorsed by them, should be accepted by the Deputy Controller of Labour in Penang.

This resolution is seconded by Mr. Gooch and passed unanimously.

(*b*).—Choultry.

The Secretary submits the following correspondence:

"Kuala Lumpur,
"*29th August, 1918.*

"Sir,

"I have the honour to inform you that the question of a Choultry at Port Swettenham was again considered at a General Meeting of this Association held on the 28th instant, when the following resolution was passed which I was instructed to forward to you—*viz.*: 'That the matter of the building of a Choultry at Port Swettenham be put very strongly to the Indian Immigration Committee with a view to this Choultry being erected out of public funds as it is for the benefit of the public and not a matter for planters only or of private subscriptions.'

"I have, etc.,
"(Sd.) H. C. E. Zacharias,
"*Secretary.*

"Chairman,
"Indian Immigration Committee,
"Kuala Lumpur."

"Office of the Controller of Labour,
"Federated Malay States,
"Kuala Lumpur,
"*31st August, 1918.*

"No. 399/18.

"Sir,

"I have the honour to acknowledge the receipt of your letter dated the 29th August current regarding a Choultry at Port Swettenham and to say that it will be laid before the Immigration Committee meeting which will be held early in November next.

"I have, etc.,
"(Sd.) J. R. O. Aldworth,
"*Controller of Labour, F.M.S.*

"The Secretary,
"Planters' Association of Malaya,
"Kuala Lumpur."

Mr. Harvey informs the meeting that the Indian Immigration Committee had asked the Government to amend the Enactment to permit them erecting choultries at Port Swettenham, Penang and elsewhere. He mentioned Penang, because at present kanganies waiting for their licences there were badly fleeced by shop-keepers and such a place was very urgently needed for them. He was very pleased to be able to tell them of the satisfactory decision arrived at, as though there might still be delay, they could be satisfied now that the thing would be done. (Applause.)

A letter from the Honorary Secretary, Central Pahang Planters' Association, *re* tappers' wages, and from the "Indian Emigrant" *re* a labour agency are placed on table.

6.—EXPORT DUTY.

The SECRETARY submits the following correspondence:

"KUALA LUMPUR,
"*30th August, 1918.*

"SIR,

"I have the honour to acknowledge receipt of your letter of 19th July, which was submitted to a General Meeting of this Association held on the 28th instant, when I was instructed to forward to you the following resolution:

"'This Association desires to record its strong disapproval of Government's action in refusing to re-establish the 'sliding scale' which was an essential part of the 1914 arrangement in connection with export duty.

"'In view of the statement by the Chief Secretary at the 1917 November Session of the Federal Council that 'Government was unable to agree to any alteration of the present arrangement unless the whole question was reopened' and also the statement by His Excellency the High Commissioner that he was 'quite willing that the question should be gone into further,' this Association is astounded at Government's subsequent action being diametrically opposed to the Chief Secretary's and His Excellency's declarations.

"'The Association considers it most regrettable that Government did not on this occasion follow the commendable procedure of 1914 by consulting the unofficial members of Council before such a drastic alteration was made in the 1914 agreement and which step has caused profound dissatisfaction to the whole industry.'

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*5th October, 1918.*

"No. 2928/17.

"SIR,

"I am directed to acknowledge the receipt of your letter of the 30th August forwarding copy of a resolution of the Planters' Association of Malaya regarding the sliding scale for rubber export duty. His Excellency fails to see that the action taken by the Government was opposed to what was said by the Chief Secretary and by His Excellency. It was a question of taking the Singapore price instead of the London price and the Government was not prepared to give the planting community the benefit of the Singapore price and at the same time let the sliding scale, which was fixed on the understanding that the London price would be taken, stand. The question formed the subject of considerable discussion and, further representations having been made, it was decided as a temporary measure to adopt the Singapore price and, for the present at any rate, to return to the flat rate of $2\frac{1}{2}$ per cent. for export duty.

"The order was published in the *Gazette* of the 22nd March and had effect from the 15th March; but, in order that the unofficial

members of the Federal Council might have an opportunity of making any representation if they wished, a letter was addressed to all of them on the 8th March stating what was the intention of the Government.

"No objection was raised to the proposal.

"I have, etc.,
"(Sd.) M. S. H. McARTHUR,
"*Under Secretary to Government, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. KINDERSLEY hopes that this matter would now be allowed to drop, as it was not an opportune moment to reopen the question. There was an unanimous feeling that the Government had not treated them quite fairly in this matter, but he feels sure that at some later date the Government would themselves re-open the question and put it in on a more business-like footing.

7.—CROP RESTRICTION.

The SECRETARY lays on table Report of Rubber Industry Protection Commission and submits the following figures collected by him in respect of stocks and crops for August, September and October:

CROP AND STOCK RETURNS.
August.

District.	Total stock of rubber on estates at 31st Aug., 1918.	Total production during Aug., 1918.
	lbs.	lbs.
Batang Padang	536,414	331,812
Batu Tiga	736,815	416,639
Central Pahang	103,946	81,261
Central Perak	985,050	546,693
Johore	1,819,199	1,160,318
Kajang	721,353	578,232
Kapar	657,321	454,040
Kelantan	408,192	307,019
Klang	661,055	379,719
Kuala Langat	594,615	281,713
Kuala Lumpur	1,016,470	643,643
Kuala Selangor	920,649	689,287
Lower Perak	973,693	537,116
Malay Peninsula Agricultural Association	1,720,974	1,281,283
Negri Sembilan	2,048,617	1,656,178
Taiping	575,034	460,502
Ulu Selangor	314,363	299,464
Total ...	15,793,760	10,104,919

CROP AND STOCK RETURNS—(*cont.*)

September.

District.	Total stock of rubber on estates at 30th Sept., 1918.	Total production during Sept., 1918.
	lbs.	lbs.
Batang Padang	448,877	292,248
Batu Tiga	891,906	521,646
Central Pahang	136,318	92,547
Central Perak	1,042,769	526,073
Johore	2,121,343	1,222,628
Kajang	813,855	559,005
Kapar	789,174	455,947
Kelantan	387,581	320,414
Klang	718,313	371,627
Kuala Langat	592,008	237,346
Kuala Lumpur	1,265,839	550,725
Kuala Selangor	1,057,889	694,023
Lower Perak	1,019,523	517,454
Malay Peninsula Agricultural Association	1,814,894	1,257,799
Negri Sembilan	3,308,229	1,426,787
Taiping	600,516	433,896
Ulu Selangor	342,278	249,762
Total ...	17,351,312	9,729,927

October.

Name of Association.	Total stock of rubber on estates at 31st Oct., 1918.	Total production during Oct., 1918.
	lbs.	lbs.
Batang Padang, D.P.A.	518,805	264,718
Batu Tiga, D.P.A.	1,048,908	365,732
Central Pahang, P.A.	147,727	85,589
Central Perak, P.A.	883,095	442,619
Johore, P.A.	2,805,819	1,420,102
Kajang, D.P.A.	729,508	416,749
Kapar, D.P.A.	796,341	301,591
Klang, D.P.A.	678,309	356,753
Kelantan	180,457	137,351
Kuala Langat	528,354	149,431
Kuala Lumpur	1,084,207	457,544
Kuala Selangor	969,873	409,436
Lower Perak	1,117,377	484,213
Malay Peninsula Agricultural Association	1,624,376	965,862
Negri Sembilan	3,544,006	1,503,784
Taiping	570,990	336,696
Ulu Selangor	249,525	206,363
Total ...	17,477,677	8,304,533

SUMMARY OF CROP AND STOCKS IN TONS.

	August.	September.	October.
	Tons.	Tons.	Tons.
Stocks	7,050	7,746	7,802
Crop	4,511	4,344	3,708

Mr. KINDERSLEY would refer members to the outline of a Draft Rubber Output (Restriction) Bill on page 39 of the Rubber Industry Protection Commission. Their idea had been all along to get a Bill on these lines passed, though not necessarily put immediately into operation. He had had an interview accordingly with His Excellency only the previous week and had gained the impression that the local Government were quite favourable to such a line of action. Since then, however, they had received the following cable from the Rubber Growers' Association:

"In view of cessation of hostilities and probable long delay incidental to obtaining Government's assistance, Rubber Growers' have withdrawn their proposal of 3rd June and are considering a voluntary scheme of control. Have you any suggestions?"

Soon after, he had seen copy of a cable received by His Excellency the Governor from the Secretary of State for the Colonies, which read as follows:

"With reference to my telegram of 20th July, Rubber Growers' Association have reviewed position of rubber industry arising out of war conditions in the light of cessation of hostilities and are of opinion that it is undesirable to proceed with their proposals for dealing with the position and they have withdrawn their proposals."

There was a difference in the two cables, in that Mr. Secretary Long said "undesirable," whilst the Rubber Growers' Association's argument was the fear of a "long delay." He personally quite failed to see the necessity on the part of the Rubber Growers' Association for such hurry to withdraw and he was much surprised that they had not awaited the arrival of the Commission's Report. As it was, they had presumably now to wait until they heard the particulars of the new Rubber Growers' Association's voluntary scheme.

As regards the Rubber Industry Protection Commission's Report, he took it that the Association approved of same (*Applause*), but he would like to say that their thanks were due to the Government for their invaluable assistance they had rendered and which had resulted in the Commission being able to present their Report in what he thinks was a record time.

Mr. RITCHIE as a member of the Planters' Association of Malaya, and not as a member of the Commission, would like the Association to record formally its regret at the action taken by the Rubber Growers' Association, before they had received the Commission's Report.

Mr. SHELTON-AGAR supports Mr. Ritchie in regretting what was really a quite callous disregard of the valuable work done and the trouble taken by the Commission. He thinks their next step should be to take a local plebiscite as to the desirability of a Restriction Enactment and if they got a two-third majority to go to Government and ask them for it. Ceylon planters had acted similarly and successfully, when a tea cess was mooted. He personally deprecated a voluntary restriction which would benefit all rubber producers.

Mr. DUNCAN observes that many representated both Planters' Association of Malaya and Rubber Growers' Association's interests and that he for one could not go against instructions received from London.

Col. FOX thinks that until they knew what the Rubber Growers' Association's proposals were, they could not do anything.

Mr. WILLIAMS recommends, since the Rubber Growers' Association asked for suggestions, forwarding Mr. Shelton-Agar's scheme to them.

Mr. KINDERSLEY strongly favours compulsory restriction. Nobody could gauge the future of the rubber market. But of course it was useless to approach either the Government or their own members, until details of the new Rubber Growers' Association's scheme were available.

Mr. MURRAY thinks that quite probably the Rubber Growers' Association had no scheme at all, but merely asked for suggestions.

Mr. BENNETT would like them to tell the Rubber Growers' Association plainly that in their opinion no voluntary scheme would work.

Mr. RITCHIE suggests that the Rubber Growers' Association be asked by cable whether they had any objections to their putting through a local compulsory scheme.

Mr. BENNETT points out that a merely local scheme was useless unless all the other rubber-growing countries fell into line.

Col. FOX asks how anybody could be expected to fall into line, unless they had a concrete proposal.

Mr. KINDERSLEY reads draft of a cable which the Standing Committee had intended to send, and after some general discussion,

Mr. JEAVONS proposes, Col. FOX seconds and it is carried unanimously that the following cable be sent to the Rubber Growers' Association:

"To-day's meeting Planters' Association much doubts efficacy of any voluntary scheme still considers compulsory restriction necessary and hopeful local legal measure will be passed, provided you strongly support same. Suggest you await receipt of Commission's full report before taking further action."

Just before the close of the meeting the SECRETARY reads the following telegram just received from the Rubber Growers' Association:

"In view withdrawal proposal for Government control can you obtain sufficient local support to existing voluntary scheme continuing

during 1919 with or without agreement minimum price stop consider adherence seventy-five per cent. all producers essential stop. This failing present voluntary system ends December stop. Immediate reply with suggestions desirable." (Laughter.)

Mr. KINDERSLEY says the matter was really much worse than he had feared, as it was obvious the Rubber Growers' Association had no new voluntary scheme to offer. He presumes their cable, as previously drafted, was to go unaltered?

Agreed to.

8.—MEDICAL.

The SECRETARY submits the following correspondence:

"KUALA LUMPUR,
"*30th August, 1918.*

"SIR,

"At a General Meeting of this Association held on the 28th instant the fees charged by Government Medical Officers for operations performed on estate coolies was discussed, and I was instructed to enquire whether a scale of fees to that effect exists and if so when it was introduced and how it has been published.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*9th September, 1918.*

"No. 1071/18.

"SIR,

"With reference to your letter dated the 30th August, 1918, I am directed to inform you that the prescribing of fees for operations performed by Government Medical Officers in Government hospitals on estate labourers has been under the consideration of Government, but it has been decided not to proceed further in the matter. The Principal Medical Officer has been notified accordingly.

"I have, etc.,
"(Sd.) M. S. H. MCARTHUR,
"*Under Secretary, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

(Applause.)

Mr. MURRAY asks whether estates, who had paid such fees already, would receive a refund? (Laughter.)

The SECRETARY submits the following letter:

"KUALA LUMPUR, F.M.S.,
"*31st August, 1918.*

"No. 987/18.

"SIR,

"In accordance with the promise contained in my letter No. 4528/16, addressed to you on the 27th March last, I am directed to forward herewith a copy of a draft Bill to amend 'The Labour Code, 1912,' in the sense of Straits Settlements Ordinances Nos. 7 of 1911 and 18 of 1913.

"2. It will be seen that the effect of the Bill, if passed, would not be to carry out in its entirety the proposal of the Madras Government that every estate hospital and dispensary should be taken over by the Government. Nor does it provide, as was suggested in paragraph 2 (*a*) of my letter to you dated the 10th January, that no further estate hospital shall be constructed by estates.

"3. It is recognized that some estate hospitals satisfactorily meet requirements, and it is not proposed to prohibit their construction in future if adequate accommodation and treatment for sick labourers can be assured. New section 201A provides, therefore, for new hospitals being established by estates subject to the written sanction of the Controller of Labour.

"4. The suggestion conveyed in paragraph 2 (*b*) of my letter of the 10th January (that on the application of the owner, and subject to the consent of Government, the control of an estate hospital may be taken over by Government) is incorporated in new section 207E.

"5. The proposal communicated in paragraph 2 (*c*) of the same letter, that Government should have the power to take over defaulting estate hospitals, is provided for by section 207F.

"6. As regards paragraph (*d*) of the same letter, it will be seen from new section 207J that the proposal that nothing should be paid for estate hospitals taken over by the Government under paragraphs 2 (*b*) and (*c*) has been modified.

"7. New section 207A gives the Controller power to close estate hospitals and to regulate their use by labourers of specified estate. This provision has been recommended as a means of ensuring that full use is made of the accommodation afforded by an estate hospital and of avoiding the building or maintenance of an unnecessary number of small hospitals or unnecessary rural hospitals.

"8. The Chief Secretary will be glad to be favoured with the views of your Association on this draft measure.

"I have, etc.,
"(Sd.) M. S. H. MCARTHUR,
"*Under Secretary to Government, F.M.S.*

"SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. KINDERSLEY says as regards the Bill *re* estate hospitals, he had just read valuable considerations expressed by the Malay Peninsula Agricultural Association thereon. The Federal Council at their next meeting were not going to consider this Bill and there was, therefore, no hurry for them to convey their opinion to Government. The Bill would be placed on the agenda of the next Planters' Association of Malaya meeting and he suggests leaving it at that.

Mr. LAWFORD enquires why the Bill was being brought in at all? Things had been going on very satisfactorily and apparently there had been no previous Government enquiry on prevailing conditions?

Mr. HARVEY says the Government would probably give as their reason the fact that they had been approached by certain planters to take over their estate hospital.

9.—MILITARY SERVICE.

The SECRETARY submits the following correspondence:

"KUALA LUMPUR,
"*30th August, 1918.*

"SIR,

"I have the honour to inform you that at a General Meeting of this Association held on the 28th instant it transpired that the practice of Medical Examiners under the Military Service Act differs in various districts in that in some the persons examined are told, immediately after, the result of their examination whilst in others they are not informed at all.

"In the opinion of this Association it is very desirable that the persons examined should be told immediately how they are classified and I am to submit that you will cause this practice to be made general in all districts.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"FEDERATED MALAY STATES,
"*30th September, 1918.*

"No. 4331/18.

"SIR,

"With reference to your letter of 30th August, 1918, I am directed to state that the Principal Medical Officer, Federated Malay States, has reported that it is the general practice, for persons examined by a Medical Board under the provisions of 'The Registration and Medical Examination Enactment, 1918,' to be informed by the Board of the category in which they are placed.

"2. Instructions have now been issued to ensure that each person so examined is informed in writing of the result of the examination.

"I have, etc.,

"(Sd.) W. MACKRAY,

"*for Under Secretary to Government, F.M.S.*

"THE SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

MR. KINDERSLEY says on the general policy no news had been received.

MR. DUNCAN draws attention to the *Straits Settlements Gazette* notification, just published, according to which no more men were to be called up for service abroad.

10.—RUBBER RESEARCH.

The SECRETARY submits Rubber Research Committee's Report (*vide* Appendix) and letter from Messrs. Guthrie & Co., Ltd., reading as follows:

"SINGAPORE,

"*15th November, 1918.*

"DEAR SIR,

"RESEARCH COMMITTEE.

"We thank you for minutes of the meeting held on 12th October.

"We have to point out that the writer attended as representing Guthrie & Co., Ltd., *and* the Malayan Association of Rubber Producers but primarily the former. This was specially mentioned to the Chairman at the time. We shall be glad if you will have the omission made good. Also, if possible, please let us have another copy of the minutes.

"With regard to recommendation II of the Sub-Committee's report, on further consideration it seems to us that it would be desirable for one member of the Local Research Board to be nominated by the agency firms and we shall be glad for this suggestion to receive consideration at the Planters' Association of Malaya meeting when the report comes up for consideration.

"We notice the minutes read 'Local Rubber Board' but presumably Research Board is intended.*

"We are, etc.,

"*per pro.* GUTHRIE & CO., LTD.,

"(Sd.) A. E. BADDELEY.

"SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

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* We see that all through it has been called a "Rubber Board" but we suggest that "Research Board" would be more appropriate.

Mr. KINDERSLEY hopes that the proposal now submitted would be unanimously approved by them. He might mention that Dr. Butler had reported to the Government substantially to the same effect though of course in greater detail and with full arguments in support of his conclusions. It was, therefore, now up to this Association to recommend the Government to adopt the scheme which had been worked out very carefully by the representative Committee appointed by them at their last General Meeting in close consultation with Dr. Butler and the Federated Malay States Agricultural Department. He feels that the adoption of this scheme by Government would mean a real step forward and it was certainly most encouraging to find that this scheme had so far been agreed upon by all concerned in this country.

Mr. RITCHIE proposes that the Association formally approve of the scheme as now put forward and that Government be informed accordingly. This was one of the best steps taken by them and a really workable scheme of active co-operation between planters and the Government and he thinks it should be given their hearty support.

Col. FOX having seconded the proposal, same is carried unanimously.

Mr. KINDERSLEY thinks that this matter should not be allowed to terminate without the passing of a hearty vote of thanks to Dr. Butler to whose valuable collaboration and advice the whole scheme was mainly due.

Mr. MCCULLOCH seconds this vote of thanks and observes that the whole industry was greatly indebted to Dr. Butler for the work he had done in this connection.

The vote of thanks is carried unanimously and the Secretary is instructed to communicate same to Dr. Butler accordingly.

11.—ROADS.

The SECRETARY submits the following letter:

"KUALA LUMPUR,

"*30th August, 1918.*

"SIR,

"I have the honour to inform you that at the General Meeting held on the 28th instant the state of roads in this country was adversely commented on and I was instructed to urge the necessity of your Government taking steps to make and keep at least main trunk-roads passable under all weather conditions.

"I have, etc.,

"(Sd.) H. C. E. ZACHARIAS,

"*Secretary.*

"UNDER SECRETARY,

"FEDERATED MALAY STATES,

"KUALA LUMPUR."

Mr. HICKSON would like to support the Ulu Selangor Association in their protest against the condition of many of the roads. The Railway had increased rates considerably and thereby thrown more general traffic on the roads and it was only right that the roads should, therefore, receive more attention.

Mr. JEAVONS says that the Kuala Lumpur Association would like to associate itself likewise in this matter. In their district too some roads were in a shocking condition and demanded immediate attention.

Mr. WATERFIELD suggests that the Chairman might be able to advance this matter at the next meeting of the Federal Council and press both for an adequate upkeep of existing roads and the construction of new roads.

Mr. KINDERSLEY agrees that the matter was one of great importance and he would be pleased to take up same as desired.

12.—QUININE.

The SECRETARY submits the following correspondence:

"KUALA LUMPUR,
"*30th August, 1918.*

"SIR,

"In view of the recent rapid increase in the price of quinine due probably to an attempt at cornering supplies, this Association at their last General Meeting held on the 28th instant instructed me to forward to you the following resolution carried unanimously—*viz.*: 'That the Government regulate the price of quinine and insure an adequate supply.'

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR, F.M.S.,
"*27th September, 1918.*

"No. 4038/18.

"SIR,

"With reference to your letter dated the 30th August, 1918, the receipt of which was acknowledged on the 2nd September current, I am directed to inform you that as quinine is imported into this country and there does not seem to be any means by which this Government can exercise any control over the supply it would appear to be impossible for the Government to regulate the price.

"From information at his disposal the Chief Secretary is of opinion that importers are not making any attempt to corner supplies. If, however, your Association can furnish any evidence that such an attempt is being made the Government will consider how the matter can be dealt with.

"I have, etc.,

"(Sd.) W. MACKRAY,

"*for Under Secretary to Government, F.M.S.*

"THE SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

Mr. MURRAY considers that the excessive price in itself was ample proof that something was wrong.

Col. FOX enquires what the present price in India was, where they had got Government cinchona plantations to keep the price down to a reasonable level.

Mr. WILLIAMS informs the meeting that the present price of pink quinine in India was Rs. 28 a lb. but that at the present time none was allowed to be exported.

Mr. JEAVONS refers to the remarks made on page 36 of the minutes of the last meeting and wonders why they should not have Government cinchona plantations in this country.

Mr. KINDERSLEY undertakes to move this question at the next meeting of the Advisory Committee of the Agricultural Department.

Mr. BENNETT asks what the wholesale price of quinine in Java was and suggests that the Government be asked to find this out.

The Secretary is instructed to write to the Government accordingly.

13.—TODDY.

The SECRETARY submits the following letter and places on table the Under Secretary's reply dated 21st of November giving the information desired:

"KUALA LUMPUR,

"*30th August, 1918.*

"SIR,

"I have the honour to refer you to the Chief Secretary's Annual Report for 1917, paragraph 73, and to ask whether we may be supplied with a statement as to the localities and shops from which samples for acidity and adulteration tests were taken.

"I have, etc.,

"(Sd.) H. C. E. ZACHARIAS,

"*Secretary.*

"UNDER SECRETARY,

"FEDERATED MALAY STATES,

"KUALA LUMPUR."

14.—STATISTICAL BUREAU.

The SECRETARY submits the following correspondence:

"KUALA LUMPUR,
"*31st October, 1918.*

"SIR,

"I have the honour to refer to your letter 4016/17 *re* Statistical Bureau and to a recent conversation which our Chairman had with the Chief Secretary.

"I am instructed to draw your attention to a paragraph on this subject which you will find on page 9 of our Annual Report for 1917, to paragraph 19 of the Rubber Industry Protection Commission's Report and to a letter addressed by the Chairman of the Rubber Growers' Association to the Under Secretary of State, Colonial Office, copy of which you will find on page 21 of attached agenda.

I am further instructed on behalf of the Association formally to recommend the appointment of Mr. D. St. L. Parsons to organize the said Statistical Bureau; this gentleman, in the opinion of my Committee, having special qualifications for the post and having had considerable experience in business, planting and Government Service.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

COPY OF LETTER ADDRESSED BY THE CHAIRMAN OF THE RUBBER GROWERS' ASSOCIATION (INCORPORATED) TO THE UNDER SECRETARY OF STATE, COLONIAL OFFICE, UNDER DATE OF 1ST MAY, 1918.

For some time past the Statistical Committee of this Association have been at work on the tabulation of figures to show the approximate acreage planted with rubber in the East. In November, 1917, the results of their preliminary enquiries, which are embodied in the accompanying circular, were issued to the members with a request for criticisms and suggestions.

You will observe in the remarks circulated with the preliminary figures the following:

"Reliable statistics of the plantation rubber industry will be of service, not only to those directly engaged in the industry, but also to the Governments of countries where rubber is cultivated. These Governments have facilities for procuring an accurate census of the acreage planted with rubber at 31st December, 1907, and in each subsequent year, together with a statement of the acreage being tapped at 31st December, 1917.

"The Committee propose to ask the Council of the Association to petition the Governments concerned to obtain and publish this information, assuring such Governments that the figures will be readily supplied on application being made to the managers of the estates."

The Council of the Association strongly endorsed the suggestion of the Statistical Committee, and the object of the present letter is to solicit your good offices in this matter.

Early in the course of their work the Committee were forced to the conclusion that the data at present available from official and unofficial sources are by no means reliable and information received since publication further strengthens this opinion. Directors of Agriculture in the countries where rubber is grown have made efforts to collect information, but having no power to enforce compliance with their request, the returns they receive are incomplete and the figures based on them are consequently misleading.

Whilst this world-war is raging it may appear to you at first somewhat difficult to justify a proposal for the collection of the statistics in question. Having regard, however, to the value which the plantation rubber industry possesses as a national asset, and to the important part which rubber will ply in future transportation, it is the considered opinion of my Council that no time should be lost in putting His Majesty's Government in a position accurately to review the rubber resources of the British Colonies and Dependencies. This information may be wanted at no distant date.

Were it in the power of this Association to carry through this work for the various Governments you may rest assured that it would be done with alacrity, but no voluntary organization can call for the necessary information from Europeans and natives with any hope of a satisfactory response, whereas Government can compel the information to be given.

Every assistance from the managers of the estates of members may be depended upon, and on behalf of the Council of this Association I beg to suggest that this matter be taken up with the Eastern Governments as a matter of real urgency.

Mr. KINDERSLEY says that a Statistical Department was very badly wanted. When he last saw the Chief Secretary on the subject, he was informed that the Government was favourably inclined towards the creation of such a body and he proposes to move at the next Federal Council Meeting that provision for this be inserted in the 1919 Estimates.

Mr. RITCHIE suggests that the statistics of the Association might be made more complete. In Negri Sembilan they had instituted a system of circularizing every year all estates in connection with a great many points which would be of interest to all planters. He would suggest that the Standing Committee take up this matter and prepare such a form so that the information may be included in their next Annual Report.

Mr. HEWETT points out that the Rubber Growers' Association were already collecting such statistics.

Mr. LAWFORD reminds the meeting that the Central Perak Planters' Association started giving this information in their Annual Reports but there were many cases in which the agents refused the publication of certain details and he feels strongly that unless such reports were complete they would prove quite misleading.

Mr. RITCHIE withdraws his suggestion.

15.—UNITED MALAYA COUNCIL.

Mr. KINDERSLEY says that owing to some misapprehension in Perak some bodies in that State had not yet joined the Council and he understands that the President, Sir Arthur Adams, was now engaged in negotiations on the subject. The central point of discussion was the number of delegates, and until this matter had been settled the Standing Committee had, therefore, taken no steps to provide for the election of Planters' Association of Malaya delegates to this new body. He hopes that by the time they met again this matter would be definitely settled.

Col. FOX thinks that in the circumstances the United Malaya Council was only half constituted.

Mr. MURRAY observes that it seemed to be a Malayan Council but certainly not United.

16.—LAND OFFICE FEES.

The SECRETARY says the Kajang District Planters' Association had at their meeting held on 21st August passed a resolution that the Planters' Association of Malaya ask the Government to pay current rates of interest on land fees deposits, such as survey fees, etc.

Mr. HICKSON as a member of that Association formally begs to move the same.

Mr. OKEDEN seconds.

Mr. MCCULLOCH considers that the proposal was one of employing wrong means to achieve a right end. What the Association ought to ask for was more surveyors and there was no reason now that normal times were returning why a sufficient staff should not be again employed to bring all work up to date and to keep it up to date.

Mr. BENNETT fears that the Kajang proposal so far from expediting would delay surveys as Government would then have a ready reply that depositors were getting interest on their money all along.

The proposal on being put to the meeting is lost.

17.—AFTER-WAR EMPLOYMENT.

The SECRETARY reads the following circular which he had sent to all Constituent Associations:

"KUALA LUMPUR,
"*15th November, 1918.*

"Dear Sir,

"It has been suggested, in connection with combatants whose billets are being kept open in this country, that it would facilitate their speedy demobilization if a request for such was made by this Association.

"In the circumstances, I shall be glad if you will kindly let me have the names of such men from your district giving, if possible, details of the units with which they are serving.

"Thanking you in anticipation,

"Believe me, etc.,

"(Sd.) H. C. E. ZACHARIAS,

"Secretary."

He also reads copy of letter from Mr. W. Percy Pinckney to the Rubber Growers' Association, London, in which he points out:

(1) That planting opinion out here is unanimous that everything ought to be done to place those who joined up back in their old billets should they wish to again come out East.

(2) That many having married no obstacle should be placed by the estates in the way of taking married men, provided of course they were men who left the rubber estates to join up, married and fought for their country.

(3) That their salaries on return should be the same as if they had remained the whole time on the estate (according to the increments given by the respective estates, *e.g.*, $25 per annum, $50 per annum or as the case may be).

(Applause.)

Mr. KINDERSLEY quite agrees with Mr. Pinckney's letter and thinks that if those men who had been in the Forces were returning to their old billets, a warning was necessary against a crowd of new men coming here on the chance of finding a billet going. He suggests that the Malay States Information Agency should be written to on the subject and asked to warn people not to come out to Malaya unless they had an assured appointment. Of course every one agreed that all those who had been to the war should be taken back and given the billets they had held before and he hopes that all members would do their utmost in this direction.

Mr. GOOCH thinks it would be better to send a cable rather than a letter.

Mr. HENDRIE questions whether it would not be better to address the Rubber Growers' Association rather than the Malay States Information Agency.

Mr. MCCULLOCH prefers that the cable be addressed to Sir William Taylor who, however, should be asked to communicate with the Rubber Growers' Association and other employers, if necessary.

Col. FOX agrees and thinks that a similar advice should be cabled to the Minister of Home Affairs in Melbourne.

Mr. LAWFORD believes that something was also needed to explain to men before coming out here what the conditions were really like and what the cost of living was.

The Secretary is instructed accordingly.

The meeting terminates, with a vote of thanks to the Chair, at 1 p.m.

H. C. E. ZACHARIAS,
Secretary.

APPENDIX.

PROPOSED SCHEME FOR THE BETTER ORGANIZATION AND CO-ORDINATION OF RUBBER RESEARCH IN MALAYA.

The following are the unanimous recommendations of the Planters' Association of Malaya:

(1) That a Local Rubber Board be formed and given statutory powers, and that the first Board be in office for one year and consist of a

Chairman: A Senior Government Officer.

Members: Two of the F. M. S. Agricultural Department;

Three to be nominated by the Planters' Association of Malaya;

Two to be nominated by the Rubber Growers' Association.

(2) That the functions of this Rubber Board be

(*a*) the executive control of the Research and Field Staff (but not the administration of the Agricultural Pest Enactment);

(*b*) administration of the funds.

(3) That the whole of the Research Staff engaged on rubber work constitute a Technical Committee which would meet periodically to discuss work. This Technical Committee would advise the Board, would submit all proposals to the Rubber Board for sanction and would also submit progress reports for the information of the Board. Such Committee should elect its own Chairman.

(4) That a salary be paid to all the scientific staff to attract and keep the best men.

(5) That the Research Staff consist (1) partly of a pensionable staff seconded from the Agricultural Department to work under the Rubber Board for five years, (2) partly of a non-pensionable staff under five years' agreement, to include as many as possible of the present non-official scientific men; comprising

Botanists	2
Chemists	4
Mycologists	5
Entomologist	1
Agriculturist with engineering experience (field experimentalist)...	1

(6) That the Field Staff consist of a Chief Field Officer and 20 District Field Officers (to be increased in number, as necessary), whose duty it shall be (*a*) to visit all estates and holdings in their district and generally to advise rubber growers, (*b*) to act as Intelligence Officers to the Research Staff and form a link between laboratory work and field practice, (*c*) to carry out field experiments with the advice of the Technical Committee.

(7) That a Selection Board consisting of leading scientists and of men with local knowledge be formed in England for the recruitment of officers under the Rubber Board.

(8) That the Board should also have power to engage scientific assistance in England or elsewhere on special lines of work outside the resources of their own staff.

(9) That a central site near Kuala Lumpur be required, and a planted area of say 200 acres (some of which in bearing) is suggested, allowing for future extensions up to 1,000 acres. The capital cost of officers' bungalows, laboratory buildings and equipment (but not including land) would probably be covered by $750,000. The Committee is advised that the present site of the Agricultural Department head-quarters is unsuitable and if new head-quarters are found for that Department, the above estimate would be appreciably lessened by putting up the two in conjunction; which from a technical point of view would be a distinct advantage (*e.g.*, common technical library, power and water supply, common use of expensive apparatus, etc.).

(10) The annual expenditure is estimated at not less than $250,000 and it is recommended that the revenue required to meet such expenditure be raised by a cess on the output of rubber (*e.g.*, on the 1917 basis at the rate of about $\frac{1}{10}$th of a cent per pound).

(11) That all initial Capital Expenditure be provided by the Government including the development of the land referred to in section 9.

H. C. E. Zacharias,
Secretary.

Abstract of Meteorological Readings in the various Districts of Malaya for the month of July, 1918.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	144.0	82.7	91.96	72.64	19.32	76.3	.785	72.0	70.	...	8.26	2.00
Pahang, Kuala Lipis	...	...	81.67	90.12	73.38	16.79	76.39	...	...	...	...	8.47	2.55
Johore, Johore Bahru	...	...	...	87.77	73.60	...	...	...	...	...	...	5.20	1.30
Singapore, Kandang Kerbau ...	29.807	156.0	83.7	88.1	75.3	12.2	78.1	.878	...	76.	S.E.	6.67	2.48
Malacca, Durian Daun	29.847	151.0	81.0	88.0	74.0	14.0	77.0	.900	...	82.	S.E.	5.16	1.10
Negri Sembilan, Seremban ...	...	154.0	79.7	87.2	75.1	12.1	74.8	.777	71.1	74.4	N.W.	4.72	1.37
,, Kuala Pilah ...	...	142.9	81.6	69.8	69.5	20.3	78.6	.926	76.4	84.1	...	3.74	1.55
,, Port Dickson...	...	...	82.5	87.5	74.	13.5	78.0	.862	74.7	78.4	...	5.05	2.07
Selangor, Kuala Lumpur ...	29.787	146.2	81.8	89.0	72.9	16.1	77.0	.849	74.1	79.0	S.W.	5.13	2.29
,, Klang	...	...	79.9	84.5	73.6	10.9	76.5	...	...	...	...	3.96	1.34
,, Kuala Selangor ...	...	...	...	88.3	74.7	13.6	...	...	...	...	...	2.21	.73
,, Rawang	...	...	...	94.5	...	...	...	...	...	...	...	1.34	.53
Perak, Telok Anson	...	...	82.34	93.0	71.0	22.0	79.0	.949	...	87.	...	4.68	2.28
,, Ipoh	...	...	81.98	94.0	70.0	24.0	76.6	.846	71.44	78.	...	2.56	.98
,, Taiping	...	112.	82.28	92.0	68.0	24.0	77.6	.885	...	81.	...	6.29	2.20
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	20.59	3.38
,, Parit Buntar	...	...	83.25	93.0	71.0	22.0	73.1	.895	...	79.	...	2.32	1.18
Penang, Georgetown	29.819	146.5	84.3	89.09	72.12	16.97	77.0	.911	...	77.3	N.W.	2.67	.39
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	3.64	1.30
Perlis, Kangar	...	...	...	89.29	73.42	15.87	...	...	...	...	...	4.91	2.16

Abstract of Meteorological Readings in the various Districts of Malaya for the month of August, 1918.

District.	Mean Barometrical Pressure at 32° F'ah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	142.0	81.6	88.25	75.64	18.40	76.0	.897	.76	73.	...	12.51	1.96
Pahang, Kuala Lipis	...	...	80.58	89.87	73.35	16.51	76.05	...	...	...	...	6.01	1.26
Johore, Johore Bahru	...	...	...	87.84	73.06	...	...	...	...	...	...	4.28	1.15
Singapore, Kandang Kerbau ...	29.825	157.5	83.6	88.1	75.2	12.9	77.9	.873	...	76.	Calm.	2.59	1.02
Malacca, Durian Daun ...	29.859	143.0	81.0	87.0	73.0	14.0	77.0	.894	...	82.	S.	5.90	2.18
Negri Sembilan, Seremban ...	...	...	79.3	86.1	75.2	11.4	73.1	.713	68.7	71.6	S.W.	9.60	2.08
,, Kuala Pilah ...	...	140.0	81.3	89.5	69.6	19.9	78.2	.912	76.2	84.2	...	6.58	1.72
,, Port Dickson...	...	119.5	81.4	86.5	72.9	13.6	77.2	.885	77.2	80.8	...	13.19	4.09
Selangor, Kuala Lumpur ...	29.830	143.1	81.9	89.4	72.4	17.0	76.0	.792	72.1	72.	S.E.	2.89	1.02
,, Klang	...	...	80.2	85.6	73.4	12.2	75.9	...	...	...	...	5.90	1.98
,, Kuala Selangor ...	...	...	...	88.7	74.4	14.3	...	...	...	...	...	3.52	1.35
,, Rawang	...	...	...	94.3	...	...	...	...	...	...	...	.35	.17
Perak, Telok Anson	...	...	82.51	92.0	71.0	21.0	78.79	.933	...	85.	...	3.14	2.48
,, Ipoh	...	...	82.29	95.0	70.0	25.0	76.49	.834	74.50	77.	...	6.53	2.71
,, Taiping	...	112.0	81.62	94.0	68.0	26.0	77.20	.877	...	83.	...	5.62	1.57
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	6.69	2.44
,, Parit Buntar	...	...	82.68	93.0	70.0	23.0	77.35	.868	...	79.	...	4.21	1.49
Penang, Georgetown	29.795	145.7	82.2	89.3	73.3	16.0	77.6	.843	69.7	77.9	S.E.	8.96	3.89
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	8.82	2.25
Perlis, Kangar	...	...	...	88.09	73.68	14.41	...	...	...	...	...	10.83	2.06

Abstract of Meteorological Readings in the various Districts of Malaya for the month of September, 1918.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	145.0	82.3	91.36	73.46	17.90	77.3	.837	73.9	75.	...	7.00	1.50
Pahang, Kuala Lipis	...	...	80.27	89.6	73.3	16.3	75.61	...	...	...	...	12.29	3.34
Johore, Johore Bahru	...	...	...	86.95	73.31	...	...	...	...	...	...	7.91	2.58
Singapore, Kandang Kerbau ...	29.845	157.0	82.8	87.8	74.4	13.4	77.9	.882	...	79.	Calm	9.47	2.73
Malacca, Durian Daun	29.871	141.0	81.0	87.0	73.0	14.0	77.0	.890	...	82.	S.	13.12	1.92
Negri Sembilan, Seremban ...	...	152.5	80.1	87.3	73.9	13.4	76.2	.821	72.1	79.7	S.W.	10.31	2.75
,, Kuala Pilah ...	...	140.4	81.3	89.5	69.7	19.8	78.7	.944	76.3	86.1	...	3.03	.90
,, Port Dickson...	...	123.8	81.4	87.1	73.7	13.4	77.5	.861	74.7	79.8	...	14.41	2.36
Selangor, Kuala Lumpur ...	29.811	142.4	81.3	89.4	73.1	16.3	75.9	.800	72.6	75.	S.E.	6.24	1.59
,, Klang	...	...	80.5	86.0	74.1	11.9	76.4	...	...	...	...	8.80	1.53
,, Kuala Selangor ...	...	...	...	88.9	74.6	14.3	...	...	...	...	...	9.27	1.74
,, Rawang	...	...	...	93.5	...	...	...	...	...	...	...	8.32	2.10
Perak, Telok Anson	...	...	81.91	92.0	70.0	22.0	77.99	.905	...	85.	...	3.89	1.41
,, Ipoh	...	...	81.62	95.0	68.0	27.0	76.36	.838	73.91	78.	...	10.59	3.02
,, Taiping	...	113.0	80.14	94.0	68.0	26.0	76.40	.862	...	85.	...	12.55	3.18
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	45.55	3.74
,, Parit Buntar	...	...	82.40	93.0	70.0	23.0	77.70	.887	...	81.	...	7.71	2.44
Penang, Georgetown	29.827	146.8	84.3	88.8	73.7	15.1	77.9	.939	69.5	82.8	N.W.	9.03	2.40
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	6.00	1.81
Perlis, Kangar	...	...	...	88.43	73.90	14.53	...	...	...	...	...	8.30	2.43